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SUMMARY OF RECENT ABSTRACTS*

VI. PLAGUE†

Epidemiology: Rodents; Fleas

IOFF (p. 609) gives an account of the history of plague research in Russia.

BRYGOO *et al.* (p. 435) describe an epidemic of pneumonic plague in Madagascar, the most serious since 1945, which spread in families, among those tending the sick, and along routes of transport of the sick or dead. Contacts, where possible, were isolated and treated with sulphathiazole or streptomycin, and patients were treated with streptomycin. The authors describe a mobile laboratory which was used, and the techniques of mouse inoculation and the preparation of cultures.

In southern Africa human plague usually results from transient murine foci derived from the permanent sylvatic foci; *Mastomys* is the strongest link between these cycles. FREEDMAN (p. 719) suggests the use of ultra-violet lamps to protect stores from rats and mice, vaccines (whose value increases with repetition), and DDT with Cyanogas. In Bechuanaland the periodical dusting of huts with DDT satisfactorily controlled fleas and plague transmission. Proofing against rodents should be brought into line with modern building science.

There had been no plague in Assam within living memory until 1956 when a small outbreak occurred in Gauhati; SEAL and BOSE (p. 296) record a number of rat deaths, followed by 4 cases in man (2 fatal) all confirmed as due to plague. DDT and BHC were used extensively, and 50,000 people were immunized, but there was reason to believe that the infection persisted in the rat population.

HAAS (p. 1026) gives an account of the first recognized indigenous case of plague reported in North America, in a Chinese inhabitant of San Francisco in 1900, and of the social and administrative upheaval which followed.

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1959, v. 56. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on plague in this series, see the July issues of the *Tropical Diseases Bulletin* each year since 1939.

KARTMAN *et al.* (p. 533) discuss sylvatic plague, noting that in the San Francisco Bay area the vole *Microtus californicus* is probably the principal reservoir and is very resistant to the infection. Its fleas, *Hystrichopsylla linsdalei* and *Malaraeus telchinum*, have high natural infection rates during epizootics. *Hystrichopsylla* is an efficient vector when blocked, and *Malaraeus* (which is abundant) can transmit mechanically. KARTMAN (p. 610) notes that the rodent reservoirs near San Francisco cannot readily be eradicated on a large scale and he has devised a bait-box to attract them; this is designed to ensure that rodents which visit it will come into contact with DDT. When these were used, effective flea control was demonstrated, with a residual effect of several months, against *H. linsdalei* and *M. telchinum*.

An account is given by DE FREITAS (p. 297) of plague in north-east Brazil, where sporadic cases occur in wild rodents though sylvatic plague is not considered to be of practical significance there. He records the fleas found on certain domestic and wild rodents and other small mammals.

MACCHIAVELLO (p. 436) traces the history of plague in part of Peru where, after introduction by man in 1920–22, it became sylvatic. An epizootic occurred in 1946–47 and the incidence of human cases rose, the mortality being greatest in children and old people, and men being more affected than women, probably becoming infected while working in the fields. An account is given of local rodents and fleas. The human outbreak in 1946–47 was checked by using DDT in houses. The same author (p. 155) shows that the flea *Polygenis litargus* from Peru and Ecuador is able to transmit plague to *Sigmodon*, *Cavia* and *Rattus*; it is apparently responsible for human sylvatic plague in those areas. Bolivia was the last country of South America to be invaded by plague. MACCHIAVELLO (p. 1127) thinks that the infection probably came from Argentina. In places the originally sylvatic characteristics have been altered as a result of invasion by murines of the genus *Rattus*. It is thought that in places the infection may have passed from man to wild rodents, and in the epidemiological sense, therefore, to have become sylvatic secondarily.

The WHO Expert Committee on Plague (p. 941) suggests that rodents resistant to plague form the permanent reservoir and maintain infected fleas during inter-epizootic periods, and that plague-infected fleas have been shown to survive starvation for a year. Sulphonamides, streptomycin and the tetracyclines are effective in treatment, and for eradication gassing, poisoning and DDT have been used, and vaccines are useful.

LHOSTE (p. 943) has published a book on European domestic rodents and the means available for controlling them. WEGNER and PRZYBOROWSKI (p. 532) report on the ectoparasites of rats in the port of Gdynia, Poland; *R. norvegicus* was common and *R. rattus* less so; almost the only flea was *Ceratophyllus fasciatus*.

KALABUKHOV (p. 942) found that susceptibility of gerbils to infection with *P. pestis* was affected by seasonal changes in heat regulation. VOELCKEL (p. 43) shows that *Rattus norvegicus* has increased relatively to *R. rattus* in Douala, French Equatorial Africa, in recent years.

HALCROW (p. 43) gives a list of rat fleas collected in Tanganyika; the most common were *Xenopsylla brasiliensis* (71·72%) and *X. cheopis* (21·72%).

For detecting *P. pestis* in wild-rodent fleas these may be pooled for inoculation into animals, and the result will be available 3–10 days later, or

they may be used for individual cultivation, when the result will be available in about 18 hours. QUAN *et al.* (p. 42) state that the method of choice remains animal inoculation, but for critical study of epizootic plague among rodents and their fleas individual culture provides invaluable data.

Aetiology: Immunization

WESSMAN *et al.* (p. 154) show that when *P. pestis* was cultivated in a chemically defined medium with glucose as the source of energy, the viable count was at first reduced, but later recovered and increased logarithmically; there was a reduction in virulence when the initial *p*H was below 7·8. WON and LIEN (p. 39) describe a fish hydrolysate medium for *P. pestis*, which is better than the commonly used heart infusion broth. HIGUCHI *et al.* (p. 825) observe that virulent strains of *P. pestis* require added calcium for growth at 37°C. in a chemically defined medium, whereas avirulent strains do not. Other details of mineral requirements are given. SMITH and HIGUCHI (p. 1027) discuss the utilization of peptides during the growth of *P. pestis*.

ANISIMOV (p. 825) demonstrated nuclear material in *P. pestis*, and describes the changes which occurred in it during a growth cycle of 16 hours.

OGG *et al.* (p. 40) confirm earlier work which showed that loss of virulence in aerated broth cultures of *P. pestis* is due to selective conditions favouring the growth of avirulent mutants, and that this selective effect can be prevented by the addition of certain filtrates of bacterial cultures, or by adjusting *p*H to 7·8 or 8·0. Details should be sought in the original. DELWICHE *et al.* (p. 824) studied the growth of *P. pestis* in culture, noting that in aerobic conditions the avirulent cells tend to outgrow the virulent, but that in anaerobic conditions the virulent cells hold their own; carbon dioxide (as bicarbonate) tends to suppress growth in air but leaves the ratio of virulent to avirulent constant, and aspartic or glutamic acids have a similar effect.

VAKE (p. 609) passaged a stock laboratory culture of S forms of *P. pestis* through groups of mice, and eventually mainly R forms were recovered in culture. These maintained their morphology during subsequent passages on media and the author claims that the morphology had undergone a change in the mice.

DZHAPARIDZE and KULIKOVA (p. 826) discuss the action of enzyme inhibitors of the tricarboxylic acid cycle on animals affected by *P. pestis* toxin.

Lyophilization has not always proved satisfactory for the preservation of *P. pestis*, and HECKLY *et al.* (p. 41) investigated the various factors which might affect its viability in and after this process. Details should be sought in the original.

Virulent *P. pestis* grown *in vivo* is very resistant to phagocytosis by neutrophils and macrophages *in vitro*, compared with strains grown in broth, and JANSSEN *et al.* (p. 437) inoculated both strains directly into the hearts of guineapigs. There was little evidence of phagocytosis of the susceptible (broth) strain by circulating leucocytes, and both strains were removed equally well by the RE cells of liver and spleen. These RE cells are therefore not affected by the factors which render virulent organisms resistant to circulating leucocytes. After initial clearance from the blood the resistant type continued to increase until death in 12–24 hours, but the susceptible type took longer to do so. KOVALEVA (p. 826) isolated an atypical strain of *P. pestis* from voles

in Mongolia, which had reduced virulence for guineapigs and regularly fermented rhamnose in 24–48 hours at 28°C.

GIRARD (p. 1128) and MANIGAULT (p. 1128) draw attention to the whitish crystalline concretions which develop in certain agar cultures of the EV strain of *P. pestis*. LESHKOVICH (p. 438) observed that X-rays appeared greatly to reduce the virulence of *P. pestis*, but did not affect the antigenicity of vaccine strain EV. BLIAKHER (p. 721) shows that cortisone markedly increases the susceptibility of mice to *P. pestis* (EV strain), and that mice treated in this way may be used in biological tests in the investigation of various materials for the presence of plague infection, especially where the bacterial count is low or the organisms are of low virulence. Although splenectomy in white mice does not modify their reaction to inoculation with virulent *P. pestis*, GIRARD (p. 1129) shows that it renders them more vulnerable to the EV strain, and less able to develop immunity after vaccination with that strain.

KOROBKOVA (p. 532) states that after intraperitoneal passage through guineapigs the immunogenic properties of the EV strain of *P. pestis* were enhanced, but not its virulence. [In the English version of this and the succeeding paper the strain is referred to as the EB strain, but in the original Russian version it is correctly named EV.] She (p. 718) isolated 2 antigenically distinct toxins from the EV strain by techniques which are described; each provokes the formation of antitoxin, and immunization of mice with live vaccine to which heat-inactivated toxin I was added was significantly more effective than with live vaccine alone. GIRARD (p. 827) shows that inoculation of live attenuated *P. pestis* (strain EV) protected 67% of mice given virulent organisms at the same time or shortly afterwards, whereas the vaccine killed by heat protected only 28%. He discusses the mechanism of this protection, which is not due to formation of antibody, but is probably a non-specific phenomenon.

KALACHEVA (p. 828) used live plague and tularaemia vaccines, mixed, for immunization of guineapigs; satisfactory protection was observed one month later when the inoculations were made either intradermally or subcutaneously, but whereas at 6 months this protection persisted after intradermal inoculation, there was a significant loss of immunity after subcutaneous inoculation. EISLER *et al.* (p. 942) observed that in mice immunized with avirulent strains of *P. pestis* the best protection was given by smooth variants, which were stable and grew more quickly than the non-smooth variants after serial passage in broth. Serological examination with the gel diffusion technique demonstrated differences in the antigenic structure of smooth and non-smooth variants and in colonies of similar morphology.

SMITH (p. 826) observed the course of pneumonic plague in mice, some of which had been treated with antitoxin, anti-fraction-I or whole plague antiserum. The best protective results were obtained with a combination of anti-fraction-I serum and whole plague antiserum. Antitoxin alone had little protective action. KHUNDANOV *et al.* (p. 720) observe that plague antisera exert a protective effect in animals, which is linked with the gamma globulin and to some extent with the beta globulin, and they refer to a method of purification by alcohol-water fractionation in the cold.

In mice immunized with avirulent *P. pestis* and later treated intraperitoneally with polyvinylpyrrolidone (PVP) daily for 14 days before being subjected to an aerosol of *P. pestis*, SMITH (p. 721) found that PVP blocked the reticulo-endothelial system and failed to protect against plague toxin. It did not

modify the susceptibility of actively immunized mice to pneumonic plague though it inhibited the early clearance of *P. pestis* from the lungs of non-immune mice. *Charles Wilcocks*

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

YOUNG, M. D. **Malaria—A Story of Scientific Exploration and Achievement.** 6 pp. 1959. Columbia: Dept. Health, Education & Welfare, Pub. Health Service, Nat. Inst. Allergy & Infectious Dis., Lab. Parasite Chemotherapy, P.O. Box 717, South Carolina, U.S.A.

A general historical account.

BHATIA, M. L., WATTAL, B. L. & KALRA, N. L. **Some Modifications in Mosquito Dissections for Malaria Parasites.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1958, Mar., v. 6, No. 2, 77–81, 3 figs. on 2 pls.

The maintenance of wild-caught mosquitoes for several days to digest the blood meal before they are dissected for sporozoites and oöcysts, may give an artificially increased infection rate as it gives sufficient time for the development of these stages in the mosquitoes. Moreover, this method makes it impossible to obtain blood for precipitin tests.

According to the authors, it is essential, therefore, to dissect the mosquitoes as soon as they are caught. With the modifications suggested in the paper, it should be possible for a technician to dissect about 45 mosquitoes per hour as against about 25 by the conventional method. The wings and legs of the mosquitoes, in the modified method, are not pulled off and this saves a considerable amount of time and also makes it possible for the entire body of the mosquito, including the severed head, to be preserved for later confirmation of identification, if necessary. The escape of blood from the distended stomach can be prevented by making the incision well above the oesophageal diverticula at the anterior end. *M. G. R. Varma*

WEYER, F. Über Schwankungen in der Zusammensetzung natürlicher *Anopheles*-Populationen in Deutschland. [**On the Variation of Natural *Anopheles*-Population Composition in Germany**] *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 435–44. [13 refs.]

Observations on populations of *Anopheles labranchiae atroparvus* and *A. maculipennis messeae* in Northern Germany over a period of more than 25 years have shown that, although malaria has disappeared, there has been no corresponding increase in the proportion of *A. m. messeae* in the population at the expense of *A. l. atroparvus*.

In Eastern Frisia 92·1% (83·7–100%) of the yearly population were found to belong to *atroparvus*, but along the River Elbe *messeae* was usually more common, 57·3% (9·4–96%) of the yearly population. Fluctuations in the proportions of the two subspecies are noticed during the year.

The density of anophelines has decreased markedly of late in this part of Germany, although there has been no concerted attempt at control.

B. R. Laurence

MORSBACH, W. O. **An Entomological Investigation of Malaria Vectors in Zululand.** *Pub. Health.* Johannesburg. 1960, Jan., v. 60, No. 1, 19–25, 1 fig.

The author reports that in Northern Zululand *Anopheles gambiae* and *A. funestus* (and *Mansonia*) were found both in untreated huts and in huts treated with BHC, but never in huts freshly treated with DDT. [The author's tables of results are difficult to interpret as there is no explanation of the abbreviations used. In one of the tables *A. gambiae* is recorded from a hut treated with DDT.]

Precipitin tests showed that *A. gambiae* had fed on man, goat or sheep, and especially on cattle, but 3 out of 12 females captured in huts were infected by sporozoites. These females were captured in an area where the percentage of blood films positive for malaria was 1–21% or more. A map shows a widespread distribution of human malaria over the Ingwavuma and Ubombo districts of Northern Zululand.

B. R. Laurence

BHATIA, M. L., MAMMEN, M. L. & RAY, A. P. **Malaria Transmission during Spring (1958) in the Plains of Uttar Pradesh.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1958, May, v. 6, No. 3, 99–103, 1 map on folding pl.

The main malaria transmission season in north-west India is from July to December. *Anopheles culicifacies*, the chief insect vector, is present in fair numbers during the spring months, but climatic conditions are then unfavourable for mosquito longevity and it has been generally assumed that malarial attacks occurring at this time are due to infections incurred during the previous autumn. Systematic dissections carried out in the vicinity of Delhi from 1953 to 1958, to elucidate this point, failed to reveal a single instance of mosquito infection.

A particularly severe outbreak of malaria, following unusually heavy rainfall and extensive flooding, occurred in the Bulundshahar district of Uttar Pradesh in the autumn of 1957. In the following spring parasites of *Plasmodium falciparum* were found in blood smears taken from 2 infants aged 1¼ and 4 months respectively, and sporozoites were found in one specimen of *A. culicifacies* out of 634 dissected.

It is concluded that malaria transmission occurred in this area in the spring of 1958, following the severe epidemic of the previous autumn. It is however impossible to say whether any spring transmission takes place in a normal year.

G. Covell

SHUTE, P. G. **Quiescent Malaria Parasites.** [Correspondence.] *Brit. Med. J.* 1960, Mar. 5, 730–31.

The author, drawing attention to a recent example of dangerous *Plasmodium falciparum* malaria in a patient in London transfused with blood from a young Nigerian medical student, stresses the probability of persistence of plasmodia at very low concentrations in the blood of apparently healthy immigrants to Britain from holoendemic malarial areas. In the case in point, the healthy, 19-year-old student from Lagos had arrived in England less than 6 months previously. Even with the knowledge that parasites must be present in his blood, a search of thick films lasting for 3 hours revealed only 1 gametocyte and 2 or 3 merozoites of *P. falciparum*, together with very scanty schizonts of *P. malariae*.

Examination of blood and splenic pulp obtained at autopsy on a young Nigerian boxer who died after a knock-out at Wolverhampton revealed scanty *P. falciparum* trophozoites and some malarial pigment.

The author points out that little is known of the natural duration of plasmodia in the tissues of highly premune indigenous residents of holoendemic malarial areas after their arrival in non-malarial temperate countries. He suggests that *P. falciparum* may maintain itself for 6–12 months, *P. vivax* 1–3 years and *P. malariae* for 20 years or more. It is fortunate that the English strain of *Anopheles labranchiae atroparvus* is resistant to infection with tropical African strains of *P. falciparum*.

The author is anxious as to the fitness of young Negroes who come to Britain to earn a living as professional boxers, and urges that the Boxing Board of Control should take steps to see that each such person

(i) is subjected to a haematological examination to exclude anaemia,
(ii) has thick and thin blood films competently examined for plasmodia,
(iii) is advised to take a course of antimalarial treatment whether parasites be found or not,
(iv) is clinically examined for splenomegaly before entry into the ring is permitted.

[The risk of malaria induced by transfusion should be borne in mind in Britain. 4 examples of this were reported from the U.S.A. in 1958.]

J. H. Walters

SYMES, W. D. & SMYTH, F. G. **Spontaneous Rupture of Malarial Spleen.** *Papua & New Guinea Med. J.* Port Moresby. 1959, Dec., v. 3, No. 3, 103–7.

A case in a European woman with *P. vivax* malaria untreated for 6 days.

CIUCA, M. Action sporontocide et clinoprophylactique de la pyriméthamine. [**The Sporontocidal and Clinoprophylactic Effect of Pyrimethamine**] *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 243–54.

The sporontocidal action of pyrimethamine alone or in combination with a schizontocidal drug was studied on 72 patients undergoing malaria therapy.

In *Plasmodium vivax* infections a single dose of 25–50 mgm. of pyrimethamine had no apparent action on erythrocytic or pre-erythrocytic forms of the parasite, but exerted an inhibitory effect on the sporogonic cycle in all cases. This action was accelerated by association with chloroquine.

In *P. falciparum* infections a similar inhibitory effect on sporogony was produced by a single dose of pyrimethamine alone or in combination with chloroquine in all cases. A single dose of 50 mgm. of pyrimethamine had no prophylactic value, having no action on the sporozoites or pre-erythrocytic forms.

It is concluded that a combination of pyrimethamine with 4- and 8-aminoquinolines might be of value in a malaria eradication programme. A scheme is suggested whereby suspected cases of malaria would receive a single dose of 300 mgm. of chloroquine base plus 25 mgm. of pyrimethamine, proved cases being treated with a 3- to 5-day treatment with chloroquine combined with an 8-aminoquinoline (in the form of plasmoquine, primaquine or plasmocide) followed up to the end of the transmission season by weekly suppressive treatment with chloroquine and pyrimethamine. This last combination of drugs would be repeated in the following spring. *G. Covell*

ARCHIBALD, H. M. **The Appearance of *P. falciparum* resistant to Pyrimethamine in a Northern Nigerian Village.** *West African Med. J.* 1960, Feb., v. 9 (n.s.), No. 1, 21–5.

An attempt was made to eliminate malaria from a village with approximately 1,000 inhabitants in the Katsina Emirate, Northern Nigeria, by administering pyrimethamine at monthly intervals from June to December 1958. The dosage given was 12·5 mgm. for children under 5 years and 25 mgm. for those of 5 years and over and for adults. The tablets were administered under supervision and attendances are described as " fair ", absentee rates being 12·5% in June, 8·8% in July, 6·2% in August and September, 8·9% in October, 15·8% in November and 18% in December. *Plasmodium falciparum* is by far the commonest malaria parasite in this region.

After 3 months of drug administration there was a marked reduction in *P. falciparum* parasitaemia and both *P. malariae* and *P. ovale* were virtually eliminated. There was not however a corresponding reduction in the sporozoite rate of the mosquito vectors (*Anopheles gambiae* and *A. funestus*).

From this time onwards trophozoites of *P. falciparum* became progressively common and the parasite rate had reverted to its pre-control level by January 1959, 8 months after the beginning of pyrimethamine administration.

A sample of the infected population was divided into 3 groups, which received treatment with pyrimethamine, proguanil and chloroquine respectively. The results indicated that the failure to control parasitaemia was principally due to the presence of a strain of *P. falciparum* resistant to pyrimethamine.

The occasional appearance of parasites of *P. malariae* and *P. ovale* in blood samples taken in January 1959 suggests that the low dosage schedule used in this experiment was not sufficient to eradicate even these infections completely.

[See also this *Bulletin*, 1958, v. 55, 482, 733.] *G. Covell*

AFRIDI, M. K. & RAHIM, A. **Further Observation on the Interruption of Malaria Transmission with Single Dose of Pyrimethamine (Daraprim).** *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 229–42, 2 figs.

The object of this trial was to test the effect on malarial incidence of a single dose of a sporontocidal drug administered immediately before the onset of the malaria season. The observations were made in a sub-montane tract in the Hazara district of West Pakistan, where the transmission season is from the beginning of July to mid-October. In the first half of this period most of the infections are with *Plasmodium vivax*, but by mid-August *P. falciparum* infections are equally prevalent and by mid-September the latter is the predominant species. *P. malariae* is rarely encountered.

There are wide yearly variations in the incidence of malaria. Severe epidemics associated with heavy rainfall and flooding occur at intervals of 7 to 10 years. In the intervals between epidemics transmission is at a low level, except in tracts situated near perennial breeding places of *Anopheles culicifacies*, the principal vector. The villages selected for the trial lie in such an area, which is described as meso-endemic.

Pyrimethamine was administered in 3 villages in a single dose, 25 mgm. to adults, 12·5 mgm. to children of 7 to 12 years and 6·25 mgm. to those below that age. In 1957 the drug was given on July 1, but in the following 2 years distribution was a fortnight earlier. All patients with fever occurring during the trial received a single dose of amodiaquine, 600 mgm. of the base to adults, 400 mgm. to children from 5 to 15 years and 200 mgm. to those below that age. A fourth village, where no sporontocidal drug was given, was kept under observation for comparison purposes throughout the period of the trial.

Spleen and parasite rates in the 3 treated villages fell steeply during 1957 and remained at a very low level throughout the 2 following years. In the comparison village no such fall was recorded. Only 2 infants out of 112 examined in the test villages were found to harbour malaria parasites during the 3 years of observation, as compared with 12 out of 17 in the comparison village.

It is concluded that in an area with a short transmission season malarial incidence can be greatly reduced, though not completely interrupted, by the administration of a single dose of a sporontocidal drug. The authors stress the importance of further research, aimed at the production of a drug with more lasting sporontocidal effect. *G. Covell*

PINOTTI, M. Considerazioni generali sopra il piano di lotta contro la malaria, nell'Amazzonia brasiliana, col metodo del sale clorochinato. [**General Considerations on the Plan of Campaign against Malaria in Brazilian Amazonia with the Chloroquine-Salt Technique**] *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 345–55. English summary.

The systematic spraying of dwellings with DDT has achieved dramatic results in Brazil. The incidence of malaria amounted to 6 million cases in 1940 and had dropped to 250,000 by 1958. An eradication programme is now in progress, aided by grants from the United States Government and in co-operation with the Panamerican Sanitary Bureau.

"Total coverage" by spraying, however, encounters special difficulties in the

Amazon basin, which extends to an area of over 3½ million sq.km. and carries a population density of only 0·65 per sq.km. The anopheline vectors—*A. cruzii cruzii, A. bellator* and *A. darlingi*—can transmit the disease in the open, *i.e.* outside dwellings, many of which actually have no walls and cannot be effectively treated through the residual action of a contact insecticide in any case. The inhabitants often lead a nomad life, engaged in the cutting of wood or the winning of rubber, gold and other minerals, and using only temporary shelters.

The efficient control of malaria through the use of chloroquine added to table salt [this *Bulletin*, 1955, v. 52, 10] has been demonstrated in other parts of Brazil—Amapà, Minas Gerais, Guaporanca and the Island of St. Francis. Chloroquine 30 mgm. is added to every 10 gm. of table salt; an adult taking some 10–15 gm. of the salt per day will thus receive a weekly dose of 210–315 mgm. of chloroquine, and this is sufficient to free the blood of parasites and is harmless to the consumer. Table salt shows no change in appearance or taste when chloroquine has been incorporated. If the salt has also been iodized to control goitre iodoform is liable to be formed and to give the salt an objectionable taste. Chloroquine phosphate is highly soluble in water and the prepared salt is packed in waterproof plastic bags to protect it against humidity and resultant loss of chloroquine. The drug is not eliminated with a mother's milk, and infants at the breast cannot, therefore, be protected against endemic malaria by the administration of chloroquine to the mother.

A malaria eradication programme, based on the use of the chloroquine-salt mixture, was launched in the Amazon region of Brazil in June 1959 and Pinotti outlines, in his paper, the arrangements for preparation, manufacture, distribution and control which are involved in the operation. *J. Cauchi*

MOSNA, E. Una grande opera sociale: l'eradicazione della malaria in Italia. [**A Great Social Achievement: the Eradication of Malaria in Italy**] *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 327–36, 1 fig. English summary.

In the autumn of 1943, the low-lying areas of the Tyrrhenian Coast were flooded for war purposes; as a result, malaria got out of control and became rampant again "as it had been in the darkest Middle Ages". A malaria epidemic did, it is true, follow the first world war and it was not until 1936–37 that the disease was under a degree of control comparable to pre-1914 days.

MISSIROLI—that great Italian malariologist—had already for some 30 years directed the application of control measures then available and had promoted anti-adult-mosquito measures in rural areas. DDT was brought into Italy by the Allied Forces and Missiroli saw the vast possibilities of this new insecticide and he set to work at once to exploit its advantages.

He first used DDT, experimentally, in the Fondi plain, in the south-east part of Latina province; in this vast flooded area, the inhabitants spent spring and summer living in temporary huts made of reeds, straw or timber and sleeping in the open air when the nights were hot, and Paris green had little chance of controlling the transmission of malaria under these conditions. When the inside of farmhouses, huts and animal sheds were sprayed with DDT, there was a dramatic reduction of the mosquito population and the

spread of malaria was arrested. SOPER and his fellow-workers were achieving equally satisfactory results in the Tiber delta. It was obvious that anti-adult measures, whatever the conditions of the housing where they were used, were sufficient by themselves to control malaria in the Mediterranean region, where *Anopheles maculipennis* is the most common vector.

Missiroli then submitted his 5-year plan to the Italian health authorities and by March 1946 the campaign was set in motion for the whole of Latina province. Wherever malaria was endemic in the province, in urban centres and rural areas, all human habitations and animal sheds were given one annual spraying with DDT for 5 years. Then, in 1952, the DDT treatment was limited to rural areas and, in 1953, to an even more restricted rural territory. No more regular DDT spraying was necessary from 1954.

For spraying in the first 2 years, DDT was used in kerosene solution. An emulsion of the chemical suspended in water with the aid of wetting powders was next adopted, with much saving in costs of material and transport. From 1952 onwards, the suspension in water was made with DDT concentrates in the form of pastes, and this last method proved even less expensive.

In the second quarter of 1944 there were, in Latina province, 35,969 primary infections and 120 deaths from malaria; 2,382 primary infections and 160 deaths occurred in 1945 (when Paris green was in use); 96 primary infections and 19 deaths in 1946 (first DDT year); 6 primary infections and no deaths in 1947, since when there have been no primary infections. Indeed, no case of malaria has been reported from Latina province after 1949.

The effect of this limited DDT treatment on the anopheline population was equally dramatic and the author gives brief details in his paper. There has been no mosquito resistance to the contact insecticides in Latina, but house-flies had become resistant to DDT by 1948. During the next 3 years, chlordane was combined with DDT for the spraying of kitchens, entrance halls and animal sheds. By 1950 the house-flies had become resistant to chlordane as well, and to other chlorinated insecticides. In 1954–56, combinations of phosphoric esthers and DDT were being sprayed to kill flies.

Similar 5-year programmes of DDT spraying have proved successful against malaria in other parts of Italy. 50 years ago malaria caused a death rate of 50 per 100,000; after only 2 annual applications of DDT the mortality from this disease had been reduced to nil. Anopheline vectors have been practically eliminated: there remain only a few *A. labranchiae labranchiae* and *A. superpictus* in the south, where minor outbreaks of malaria still have to be controlled from time to time. *J. Cauchi*

BUSLAEV, M. A. & VASYUTA, Y. S. **[The Final Stage of Malaria Eradication in the Russian Soviet Federative Socialist Republic]** *Med. Parasit. & Parasitic Dis.* Moscow. 1959, v. 28, No. 5, 518–22. [In Russian.]

In 1957 the Ministry of Health of U.S.S.R. issued a directive for the speeding-up of the eradication of malaria in the country. The authors record the results of the antimalarial campaign carried out in 1958 throughout the Russian Federative Republic (R.S.F.S.R.) [which comprises the greater part of the Soviet Union, extending from Europe and through Siberia to the Far East]. As the result of these operations the incidence of malaria in R.S.F.S.R. in 1958

was 2·1 times lower than in 1957 (1,036 and 2,246 cases respectively). However, the fall in incidence varied in different areas, and about half (49·1%) of the recorded cases occurred in Eastern Siberia, as shown in the accompanying table, whereas in the European zone (except northern Caucasus) malaria was completely eradicated.

Incidence of Malaria in R.S.F.S.R.

Area	Reduction of incidence shown as percentage of previous years		Index per 10,000 of population in 1958
	1957	1958	
Far East	65·0	36·0	0·02
European R.S.F.S.R.	75·3	70·1	0·01
Western Siberia	65·6	71·0	0·13
Urals	57·4	30·4	0·15
Eastern Siberia	47·7	41·8	0·76

In analysing the prevalence of malaria in various areas, it is pointed out that insufficient data are available regarding imported cases. According to incomplete figures, in 1958 they comprised about 10% of the recorded cases, in 1957—7·9%. Special attention was devoted to the discovery of parasite carriers. Thus, in 1957, mass examinations of blood films from 2·2 million persons revealed 130 carrier cases, while in 1958 there were 77 carriers among 28·4 million persons examined. The authors attach special importance to the early diagnosis and treatment of all malarial patients and carriers. In 1958 about 70% of patients who had been treated with schizontocides (bigumal [proguanil] or arichin [mepacrine] with plasmocide [pamaquin]) were given a course of chinocid [a structural isomer of primaquine]. It is noted that the weather in 1958, which was unfavourable to mosquito breeding and to the sporogony of the parasite, also contributed to the success of the antimalarial campaign. The authors are confident that the combined measures adopted by Soviet malariologists will result in complete eradication of malaria in R.S.F.S.R. in 1959–60. *C. A. Hoare*

Cahiers de L'O.R.S.T.O.M. No. 1. Le paludisme dans la zone pilote antipaludique de Bobo Dioulasso (Haute Volta, A.O.F.). [**Malaria in the Malaria Control Pilot Zone of Bobo Dioulasso, Upper Volta, French West Africa**]. 125 pp., illustrated. [Numerous refs.] 1959. Office de la Recherche Scientifique et Technique Outre-Mer. Paris VII^{e}: 20, Rue Monsieur.

The pilot project of Bobo Dioulasso now covers an area of 7,347 sq.km. with a population of 49,909, in an area of the Upper Volta in which malaria has always been holoendemic and stable. Spraying was started in 1953 when DDT and BHC were used, but the programme has undergone changes and in 1958 included one annual application of 2·2 gm./m.^{2} DDT in 85 villages, an equivalent bi-annual DDT treatment in 18 villages, a selective annual treatment with DDT in one and two annual applications of 0·5 gm./m.^{2} dieldrin in 2 others. There was no profound original malaria survey but this weakness has

been more than remedied in the course of operation. Malariometric and entomological findings are presented in detail for neighbouring untreated areas and for the pilot project itself. Malariometric studies include the traditional techniques but are presented partly in the form of new indices intended particularly to apply to the needs of eradication mechanisms:—the New Contamination Index a percentage of persons in a particular age-group who were previously free from parasites but developed new infections within an observation period of one month, and the Cumulative Parasite Index or percentage of infants who have at any time shown parasites in their peripheral blood. Entomological enquiries had the principal object of determining vector species, the place and hours at which they bit and conveyed infection, their seasonal variations in number and infectivity, resting places at different phases of their life and their susceptibility to the currently used insecticides. Numerous techniques were employed to give a complete picture of the life history of the anopheline including hand capture, trap huts, trap nets, night captures, and outdoor catches of different types. The results are presented as statements, for each important species, of density, aggressiveness or biting frequency, resting habit and infectivity. The section on entomological results includes a list of 23 anopheline species recorded and gives a detailed statement of the reaction to control by all the more important:—*Anopheles coustani*, *A. nili*, *A. funestus*, *A. flavicosta*, *A. gambiae*, *A. longipalpis*, *A. brohieri*, *A. wellcomei*, *A. rufipes*, *A. pharoensis*, and *A. squamosus*.

Malaria transmission has not been brought to an end. New infections have continuously occurred in infants and the Cumulative Parasite Index for infants aged up to 12 months in the treated areas remains at 14·7% in contrast to 75% in untreated areas. Analysis of the entomological findings shows some material change in the pattern of anopheline behaviour and variation in importance as hosts. In the untreated areas transmission is primarily by *A. gambiae* and *A. funestus* with *A. nili* in a secondary role. In the treated villages *A. nili* seems to play a principal part followed at a considerable distance by *A. gambiae* with a perhaps accidental significance of *A. brohieri* and *A. coustani*. In the treated temporary houses in the fields, *A. nili* is also the main carrier though *A. gambiae*, *A. funestus* and *A. flavicosta* play some small, perhaps even negligible, part. In all of these areas, transmission still takes place principally inside the houses and in the second half of the night, but on a much reduced scale; the annual number of infective bites has been reduced in the treated area to one-hundredth of that in the untreated and in the temporary field houses to one-fifth. This indoor transmission continues in spite of a marked change in aggressiveness in the treated areas where it has become five or six times more marked outside than inside. This external aggressiveness, however, has been delayed until later in the night when most of the inhabitants have retired to their houses with the result that the tendency to bite outdoors is frustrated by lack of opportunity. Decrease in transmission is by no means entirely due to decrease in normal longevity of the vector, which indeed is less than might be expected. Other relevant changes include irritation leading to outdoor biting, which is very often on domestic animals as is shown by precipitin examination. There is also an associated decrease in density, and even at some times of the year a lengthening of the gonotrophic cycle and also of the period of extrinsic development of the parasite due to the mosquito being driven outdoors into a cooler environment.

It is concluded that malaria eradication by single annual doses of DDT is not possible under these circumstances. The authors make use of mathematical analysis following the lines developed by the reviewer [this *Bulletin*, 1958, v. 55, 229], but with significant development and constructive criticism. The original theory went no further than to regard the inoculation rate as relatively constant in time but it is here developed to allow for seasonal variations, both in strict theory and in reasonable approximation, the latter utilizing the mean rate over a number of months. The utility of these approaches is examined and they are found to give usable information under many circumstances, though in the treated zone anophelines may be so few as to render the indices unmeasurable.

This publication inaugurates a new series of bulletins to which members of the Office de la Recherche Scientifique et Technique Outre-Mer will increasingly contribute, though not to the exclusion of previous channels. The authors are not mentioned in the title though it is made clear in the introductory matter that this work is attributable to the collective efforts of R. Choumara, J. Hamon, J. P. Adam, J. Ricosse and H. Bailly.

[There is as yet no major example of successful eradication of malaria in equatorial Africa and probably the major impediment to success has been the absence of precise analysis of the form in which malaria and its transmission continues in the presence of schemes for its eradication. This paper is an extremely valuable contribution to the understanding of this subject. It gives a better insight into entomological happenings than has previously been available, and includes several new techniques which deserve wider adoption and further experimentation. All concerned in malaria eradication in Africa are advised to study it in its original form.] *G. Macdonald*

Toumanoff, C. Paludisme et perspectives de la lutte antipaludique dans la basse Guinée. [**Malaria and the Outlook for the Antimalarial Campaign in Lower Guinea**] *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 411–22, 4 figs. [20 refs.]

During the period 1956–57 malaria surveys were conducted in the town of Conakry and the peninsula of Kaloum on which it lies, and in the Rio Nunez estuary, in French Guinea. Detailed accounts of both these surveys have already been published [this *Bulletin*, 1959, v. 56, 509, 1104]. The paper here presented is a compendium of the two reports.

The results of spraying dwellings with residual insecticides in Conakry have been disappointing and the persistence of malaria in and around the town is attributed chiefly to the exophilic behaviour of *Anopheles gambiae* var. *melas*. In both areas transmission is maintained during the dry season by the breeding of *Anopheles* in what are described as adventitious foci. The author concludes that in this region the spraying of dwellings with residual insecticides should be supplemented by antilarval measures of a permanent nature. *G. Covell*

Rao, B. A. **Malaria Eradication Programme in India.** *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 357–69. [15 refs.]

A brief account is given of the malaria control measures which preceded the implementation of the gigantic eradication programme now in progress in

the Indian sub-continent, details of which are outlined in the body of the paper.

Destruction of the adult mosquito by pyrethrum sprays had been practised in India from 1936 onwards, following reports of its successful use in Zululand. It was employed first in Delhi and later in Bombay State with considerable success, but was replaced in 1945 by DDT. By the end of 1953 some 30 million people in Bombay and Mysore States were under protection by this method.

In that year the National Malaria Control Programme, designed to protect 200 million persons out of an estimated 360 million living in malarious areas, was inaugurated. A primary need was the provision of trained personnel, and this task was undertaken by the Malaria Institute of India, which by 1958 had placed 193 units in the field, each capable of dealing with a population of 1 million. The object of this campaign was limited to the reduction of malaria to a level at which it would no longer constitute a major public health problem. During the years of its operation there was a steady decline in malaria incidence throughout the protected zone.

In 1958 India adopted the policy of total eradication of malaria, which necessitated considerable modification of the national programme. In addition to the population of 230 millions residing in areas of hyper- and mesoendemicity it was now necessary to protect an additional 160 million persons living in areas classed as hypoendemic. The total number of units required for this purpose was therefore raised to 390.

The plan of the eradication programme now envisaged consists of:

(1) *Attack phase* (1958–59 to 1960–61). This involves the spraying with residual insecticides of every human dwelling and cattle shed twice yearly for 3 years.

(2) *Consolidation phase* (1960–61 to 1963–64). In this phase spraying will be discontinued provided that the following criteria are satisfied:—

(a) child spleen index of 5% or less for 2 consecutive years;

(b) child parasite index of 1% or less for 2 consecutive years;

(c) infant parasite index of *nil* for 2 consecutive years;

(d) absence of evidence of fresh indigenous malaria cases during the year before contemplated termination of spraying.

(3) *Maintenance phase*. This implies continued vigilance for any unusual prevalence of fever, investigation for any evidence of malaria and the implementation of such preventive measures as may be indicated. The maintenance phase is regarded as a routine activity of the State Public Health Department.

As revised, the Indian Eradication Programme will extend over a period of 8 years and will cost approximately 1,035 million rupees, which works out at about 5 annas (6 cents) per head per year. This is, as the author remarks, considerably less than the cost of a single course of treatment for malaria. If all goes according to plan, the disease will have been eradicated from the entire country by 1965–66. *G. Covell*

ARTHUR, J. H. **Results of Malaria Control in the Tea Districts of Assam and North Bengal.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1958, Jan., v. 6, No. 1, 22–32.

A general picture is described by particular reference to two tea gardens in Northern Bengal which have been the object of study since the beginning of the

century owing to the particular difficulty which they have always presented. Malaria is transmitted by *Anopheles minimus minimus* and up till the development of residual insecticides was impossible to control fully despite energetic efforts in the application of antilarval methods. The early post-war work relied largely on prophylactic proguanil which secured good results but short of total success, its weakness lying in the inevitable irregularity of administration. Early work with gamma BHC applied at 10 mgm./sq.ft. every 6 or 7 weeks secured a comparable effect but with small occasional recrudescences. This programme was refined by close examination of the dates of application to ensure coverage for the season and by modification of the dose on some applications to 20 mgm./sq.ft. By these means a fully effective mechanism has been worked out which has resulted in the virtual total control of malaria on these estates. 3 positive infections have been found in 969 infants examined.

The paper is illustrated by statistics referring to two groups of estates in northern Bengal and two in the south. *G. Macdonald*

PETERS, W. **Malaria Control in Papua and New Guinea.** *Papua & New Guinea Med. J.* Port Moresby. 1959, Dec., v. 3, No. 3, 66–75, 3 figs. [23 refs.]

Malaria in Papua and New Guinea continues to be a major health problem, and is responsible for 15·03% of all hospital admissions and 12·64% of all deaths in hospitals. An average of approximately 16,000 cases of malaria were admitted to hospital annually during the period 1952–57. In the holoendemic area of Maprik it is estimated that some 60% of all infants die before attaining the age of 18 months, malaria being the chief contributory factor. In the highland areas malaria is seasonal and unstable, the conditions favouring the periodical occurrence of severe epidemics involving all age-groups of the population [this *Bulletin*, 1959, v. 56, 269, 1214].

The principal malaria vectors are members of the *Anopheles punctulatus* group, and it has been shown that the majority of feeds are taken indoors and that the anophelines rest both before and after feeding on surfaces within the houses [*ibid.*, 1957, v. 54, 651]. Circumstances therefore appear favourable for the conduct of an eradication campaign by the use of residual insecticides. An experiment designed to test the effect of residual spraying combined with mass single-dose 6-month administration of pyrimethamine is at present in progress in the Maprik area.

A comprehensive plan envisaging a 14-year campaign against malaria for Papua and New Guinea is outlined. The estimated total cost of this programme is £2·3 millions, which represents an annual *per caput* cost of 2s. 11d.
G. Covell

CH'EN, C. T., CHEN, H. H. & CH'EN, W. I. **Report on the Evolution of Malaria Surveillance Scheme in Taiwan.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1958, Mar., v. 6, No. 2, 49–75, 4 maps (1 on folding pl.) & 1 chart.

The malaria eradication programme in Taiwan has advanced to a stage where the disease has become rare and parasite carriers discovered by routine

processes are few. Under the original scheme the search for residual cases was carried out on a part-time basis by public health technicians attached to a local authority and with responsibility for many other activities. Though originally appropriate, this mechanism has become less useful with the advance of the programme and in the first half of 1957 resulted in the discovery of only 11 positive cases, though 23,220 films were examined. Though slight, some degree of transmission may still occur in about 240 "villages" with an aggregate population of 296,850, and there are a further 1,022 "villages" with a population of 1,275,500 which were formerly malarious and in which transmission could perhaps be resumed. Surveillance has been modified in the first of these two types by the creation of mobile malaria detection teams, each comprising 5 technicians, which undertake an active survey with particular reference to infants, children born after the start of the campaign, and persons with fever. The yield of positive cases is higher, 133 in 1956–7. Parallel surveillance mechanisms include quarterly mass blood surveys in the active malaria foci, films being examined from all inhabitants, comparable quarterly survey of infants and persons with fever in other potentially less malarious places, monthly visits to all schools, visits to public and private clinics and a detailed follow-up of persons found positive, including the examination of residents in the same and neighbouring houses.

The paper contains other details of the programme which includes, as well as standard procedures, the mass treatment of all inhabitants of the still malarious areas once every quarter with a single dose of amodiaquine or chloroquine. Monthly drug prophylaxis is also given to the relatives and neighbours of positive subjects. These methods are hopeful but the campaign is said to be in a precarious position owing to inadequacy of funds to implement fully realistic surveillance mechanisms. *G. Macdonald*

PAMPANA, E. La ricerca del casi nel corso dell'eradicazione della malattia. [**The Detection of Malaria Cases during the Eradication of the Disease**] *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 337–44. English summary (9 lines).

A malaria eradication campaign rests mainly on 2 public health measures, namely, "total coverage" with the spraying of a contact insecticide against adults in dwellings and "epidemic surveillance" for the detection of any remaining cases of malaria and for their control. "Cases" in this context include any person with malaria parasites in the blood, whether or not there is also pyrexia or other signs or symptoms of the disease.

The author tabulates, for 1958, data of epidemic surveillance carried out in 14 countries which were then at the consolidation phase of a malaria eradication campaign. The areas concerned varied between 26 sq.km. (Trinidad) and 110,977 sq.km. (the Philippines); populations protected were between 14,000 (Peru) and 5,466,000 (the Philippines). All 14 countries organized an "active search" for cases by specially trained personnel, the frequency of whose visits ranged from fortnightly to every 6 months, and the population supervised by each inspector varied between 4,000 and 25,000. The rate of blood specimens taken in this "active" searching varied between 0·04% (Ceylon) and 9% (Venezuela) of population. From 6 countries there comes information

on cases found through notification by doctors, hospitals and dispensaries. 4 countries carried out surveys to determine the parasite index. "Passive" or indirect search for cases, by various means, is reported on from 5 countries and these channels of information seem to have been the least fruitful of all. The author concludes, however, that each of these methods of epidemiological surveillance can make its contribution to the efficacy of an eradication programme and that none, therefore, should be neglected. *J. Cauchi*

SINGH, J. **Malaria Eradication and its Future.** *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 397–402. [10 refs.]

The author of this paper, formerly Director, Malaria Institute of India, and now Director-General of Health Services, gives a brief account of the history of malaria prevention since the end of World War II.

The spectacular results of the earlier DDT campaigns engendered exaggerated hopes for the early conquest of malaria. At first it was assumed that there would be little further need for basic and fundamental study, but it soon became apparent that a great deal remained to be learnt, especially in regard to the behaviour of the various insect vectors of the disease. Reports of resistance to residual insecticides on the part of certain species of anopheline mosquitoes have occasioned considerable disquiet, but have also provided an incentive for increasing the tempo of the eradication programme. A table is included showing the stage reached in the various countries where eradication programmes were in progress at the time the paper was written.

The author visualizes that in the foreseeable future malaria will cease to be a continuing health problem. He discusses the future of the large body of workers now engaged in campaigns for the eradication of malaria, but has no doubt that these will find little difficulty in obtaining employment in other fields. Personnel so trained will always be required for combating other communicable diseases and for building up a composite health service. *G. Covell*

HUFF, C. G. **Post Eradication Malariology.** *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 289–92.

The spectacular success achieved in many countries by the malaria eradication schemes now in progress has brought the eventual disappearance of the disease from the entire globe within the realm of possibility.

The purpose of this article is to stress that this consideration should not bring about any slackening of basic research on malarial parasites, for two principal reasons. The first is that eradication of the disease has not yet been accomplished and that unforeseen obstacles may well arise to delay its consummation. Secondly, with the eradication of the malaria parasites of man, many of the basic problems of malariology will still remain unsolved, and these problems will be sufficiently important to justify continuance of the study through the use of malaria parasites of animals, of which the vertebrate hosts include lizards, birds, rodents, bats and primates. In recent years great advances have been made in the technique of tissue culture as a means of

growing the exo-erythrocytic stages of the species parasitic in birds. Improvements have also been made in many of the techniques employed in the study of exogenous stages of the parasite.

It is concluded that the continued use of malarial parasites as tools for advancing our knowledge on a broad front is desirable, if not essential.

G. Covell

MACDONALD, G. **The Dynamics of Resistance to Insecticides by Anophelines.** *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 305–15.

The prospects of preventing insecticide resistance from developing in mosquitoes by exposing them to mixtures of insecticides (DDT and dieldrin) are considered on the following basis:—(a) the single-gene mechanism of resistance (a recessive gene for DDT in, for example, *Anopheles sundaicus*, and essentially a dominant gene for dieldrin-resistance in, for example, *A. gambiae*); (b) laboratory tests of these strains and a normal susceptible strain of *A. gambiae* against serial concentrations of each insecticide separately, and in mixtures.

A general statement is given of the fundamental differences between the two insecticides in terms of the rapidity with which resistance may be expected to appear on account of their different genetic mechanisms. As events have shown, DDT resistance takes years (*e.g.* 4) to become apparent but then becomes rapidly dramatic. Dieldrin (and with it BHC) resistance can be expected to, and does, arise much more rapidly. With DDT resistance, the susceptible heterozygotes (which carry one gene for resistance) tend to be eliminated by DDT pressure and the gene frequency in the exposed mosquito population kept lower than with dieldrin resistance, in which the resistant heterozygotes, in addition to those mosquitoes homozygous for resistance, can survive experience of dieldrin. Events also indicate that this recessive gene for DDT resistance is widely distributed and it is reasonable to suppose that DDT resistance may yet appear where it has so far remained inapparent over some years of DDT pressure. The actual time necessary for this undesirable manifestation depends on the selection pressure and the initial frequency of the gene prior to the use of DDT. The dieldrin resistance gene may, perhaps, be less universal (its widespread occurrence in West Africa and rarity elsewhere in that continent is cited). On the other hand, if present, even in low frequency initially, the rapidity of its selection as the predominant gene is well appreciated from practical experience. The comparison is further elaborated mathematically.

Either type of resistance appears with predominance of the gene concerned, either as homozygous individuals for DDT resistance or as both homozygous and heterozygous individuals for dieldrin resistance. Reducing selection pressure to delay their predominance is the basic requirement for preventing this undesirable outcome in residual spray campaigns. From the data derived from the laboratory experiments reported, it is shown that mixtures of DDT and dieldrin will effect greater kills of individuals homozygous for DDT resistance than would DDT alone. This eliminates more of this gene from the population, thus reducing, in effect, selection pressure, and could be conceived to delay significantly the build-up of a DDT-resistant population. But

mixtures of insecticides of the kind investigated are thought not to be adequate for reducing substantially the rate of selection of resistance to dieldrin (and BHC). Mixtures might well be effective in obtaining complete kills of all normal mosquitoes exposed, giving at once the best safeguard against transmission and any resistance inherent in the vector.

The results are discussed tentatively and suggested as a basis for further investigation under field conditions. *D. S. Bertram*

Bouisset, L. & Ruffié, J. Evolution du paludisme à *Plasmodium berghei* (Vincke et Lips) chez le rat blanc *Rattus norvegicus* L. var. *albus* carencé en vitamine A. [**Course of *Plasmodium berghei* Malaria in White Rats deficient in Vitamin A**] *Ann. Parasit. Humaine et Comparée.* 1958, v. 33, No. 3, 209–17, 3 charts & 3 figs. [14 refs.]

As is known, rats fed on a normal diet are highly resistant to infection with *Plasmodium berghei*, the majority of inoculated animals recovering spontaneously after 2–3 weeks, while some show no evidence of infection at all. In the present paper the authors describe the course of infection in rats maintained on a diet deficient in vitamin A. Three months later they were inoculated with *P. berghei*, which produced progressive parasitaemia, resulting in death of the animals after 8–10 days. On the other hand, when 2 rats, fed on the same diet and showing all signs of vitamin A deficiency, were given a dose of 2·5 cc. of Auxergyl (vitamins A + D) at the time when they were inoculated with *P. berghei*, their infection was inhibited and terminated in recovery, as in the case of normal controls. It was thus demonstrated that the acute course of the infection in rats was due to the absence of vitamin A in their diet and not to the physical deterioration of the animals, produced by vitamin deficiency. *C. A. Hoare*

Fabiani, G., Orfila, Jeanne & Bonhoure, G. Influence de la gestation sur le paludisme du rat blanc à *Plasmodium vinckei*. [**Influence of Pregnancy on Infection with *Plasmodium vinckei* in White Rats**] *C.R. Soc. Biol.* 1959, v. 153, No. 7, 1200–202.

As is known, adult rats are highly resistant to *Plasmodium vinckei*, the infection being either transient, with scanty parasites in the blood, or producing low parasitaemia at irregular periods up to a fortnight. On the other hand, in young rats the infection runs an acute—and frequently fatal—course.

Having observed that in pregnant females the infection produced a significant rise in parasitaemia followed by a rapid decrease after parturition, the authors carried out experiments to determine the effect of pregnancy on the course of the malarial infection. With this end in view, 28 gravid rats were infected with *P. vinckei* at different periods of gestation. In 16 of these rats the infection was more acute than that usually observed in normal adult rats, its severity and the degree of parasitaemia being the greater the nearer the time of inoculation was to full term. However, after parturition there was an immediate decrease of parasitaemia, though sometimes it persisted during the period of lactation. *C. A. Hoare*

FERNEX, M. Note sur les variations du nombre des mastocytes dans le myocarde du poulet et du singe au cours de la malaria expérimentale. [**Variation in the Number of Mast-Cells in the Myocardium of Chickens and Monkeys in the Course of Experimental Malaria**] [Miscellanea] *Acta Tropica*. Basle. 1959, v. 16, No. 4, 362–5, 3 figs.

The role of the basophile leucocyte (mast-cell) is discussed in relation to its reaction in immunity after parasitic infections, and it was noted that the index was 3 times as high in Africans as it was in Europeans. Then observations were made on the density of the cells in the heart muscle (left ventricle) of month-old chickens infected with *Plasmodium gallinaceum* and killed 6, 8, 10 and 12 days respectively after infection; at the same time, similar observations were made on infected birds, whose reticulo-endothelial system had been blocked by intravenous inoculations of India ink. The latter group of chickens suffered from a much more severe illness. The mast-cell index in the sections of muscle varied from individual to individual, but showed no significant differences either between these two groups of birds or between them and non-infected controls. The experiment was repeated in *Cercopithecus aethiops* monkeys infected with *P. cynomolgi*, the majority of which had been splenectomized. The duration of the infection was much longer (up to almost a year) than that of the avian infections. The mast-cell index was remarkably constant, about 4·6 cells per sq. mm. (7μ thick) of heart muscle, and was unaffected either by the length of the infection or by splenectomy.

These results suggest that other factors—such as malnutrition—may be responsible for the changes in different races of man. [It should be noted that AL-DABAGH (*Trans. Roy. Soc. Trop. Med. & Hyg.*, 1959, v. 53, 8] demonstrated that a tremendous infiltration of reticulo-endothelial cells occurred in the heart muscle of chickens infected with *P. juxtanucleare* after several months of the disease.] *P. C. C. Garnham*

TRYPANOSOMIASIS

*In this section abstracts are arranged as far as possible in the following order:—*African*—human, animal;* American*—Chagas's disease and other trypanosome infections. In each form the following order is followed:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

COLONIAL OFFICE. **Colonial Research 1958–1959. Tsetse Fly and Trypanosomiasis Committee. Report for 1958–1959** [MULLIGAN, H. W., Chairman] (pp. 365–86). Cmnd. 938. 419 pp. 1959, Dec. London: H.M. Stationery Office. [18s.]

The main preoccupation of the Committee has continued to be chemotherapy and chemoprophylaxis, particularly in relation to trypanosomiasis in cattle; dramatic advances in this subject have necessitated the organization of both laboratory and field trials, work in which the Committee's Chemotherapy Panel has played an important part. Nevertheless the Committee believes that the ultimate aim of eradicating trypanosomiasis from Africa will only be achieved by the use of many different control measures and that therefore studies must continue for many years on pathology, protozoology, epidemiology,

immunology and entomology. Even the effectiveness of drugs is likely to be closely linked with the immune response of the host and an adequate reduction in the vector population. The Committee will continue to ensure that a proper balance is maintained in the research programmes of the regional trypanosomiasis research organizations in East and West Africa.

The rapid communications now available have enabled the Committee to foster collaborative studies, in chemotherapy, chemoprophylaxis and immunology, between workers in the United Kingdom and Africa; it is felt that in addition to extending such studies into new fields, the encouragement of workers to undertake research at centres in the United Kingdom, on certain fundamental trypanosomiasis problems, may prove to be a useful means of rendering continued scientific assistance to the emergent territories after their attainment of independence.

The bulk of the report is taken up with summaries of the annual reports for 1958 of the East African Trypanosomiasis Research Organization [this *Bulletin*, 1960, v. 57, 561], and of the West African Institute for Trypanosomiasis Research [*ibid.*, 1959, v. 56, 1011].

The report concludes with the activities of the territorial departments. In Sierra Leone, the results of the Veterinary Department's trials with the WAITR antrycide-suramin complex, against *T. simiae* infections in pigs, indicate a promising degree of protection. The Veterinary Department of the Northern Region, Nigeria, records that drug-resistant strains of trypanosomes are being produced in the field, that Prothidium has been discarded owing to its toxicity and the short duration of prophylaxis achieved under local conditions, and that *G. morsitans* continues to advance; however, progress is being made in certain tsetse eradication schemes in which insecticides are being used. In part of Nyasaland, investigation has shown that stock losses are primarily due to the mechanical transmission of *T. congolense* by biting flies; it is hoped that the trypanosome reservoir will be eradicated by treatment with antrycide. Experience in Northern Rhodesia indicates that *T. brucei* infections in dogs invariably respond to pentamidine unless the dog has previously been under antrycide prosalt prophylaxis, when Melarsen must be used. The Kenya Veterinary Department has continued its investigations into the use of insecticides for tsetse eradication, mechanical bush clearing, drug resistance and cross resistance and the efficacy of new drugs: two herds of cattle treated at 3-month intervals, one with the antrycide prosalt and the other with the new drug Metamidium, have both been completely protected from trypanosomiasis for 12 months. The Tanganyika and Uganda Veterinary Departments have also carried out series of toxicity and field trials with the newer prophylactic drugs.

[For 1957–1958 Report, see *ibid.*, 1959, v. 56, 677.] *T. A. M. Nash*

MOÇAMBIQUE. Missão de combate às tripanossomíases. Relatório anual de 1957 [DE ANDRADE SILVA, M. A.]. [**Annual Report for 1957 of the Trypanosomiasis Commission**] 95 pp., 4 graphs (3 folding), 3 folding coloured maps & 10 figs. on 7 pls. 1959. Lourenço Marques: Imprensa Nacional de Moçambique.

A tsetse fly survey of endemic areas of sleeping sickness in Portuguese East Africa was carried out in the regions of Mogincual, Pebane, Maganja da

Costa, Báruè, Mossurize and Massangena; notes are given on the occurrence of *Glossina morsitans*, *G. austeni*, *G. pallidipes* and *G. brevipalpis* in these areas.

New cases of sleeping sickness diagnosed in 1957 totalled 221. Laboratory data are given on the main investigations carried out, including those for *Spirochaeta duttoni*, *Schistosoma* and *Mycobacterium leprae*, as well as for trypanosomes and malaria parasites.

In the field of animal trypanosomiasis data are given on results of blood examinations, 732 infections being found in 15,253 domestic animals for 7 regions. Blood examinations of 7,685 wild animals, including 7,596 mammals, revealed infections in only 30, 11 of which were found in various fish species. Treatment of 66,765 domestic animals, mostly bovines, was carried out in 1957, with the use mainly of dimidium bromide and some use of antrycide methylsulphate and Berenil.

In the control of tsetse by indiscriminate game destruction 10,166 animals were destroyed, bringing the total since the beginning of the campaign in 1949 to 55,312.

Entomological data include information on numbers of tsetse flies captured on fly-rounds in various regions and also those caught on vehicles.

[For 1956 Report, see this *Bulletin*, 1959, v. 56, 1112.] *E. R. Nye*

SAUNDERS, D. S. **Ovaries of** *Glossina morsitans*. [Correspondence.] *Nature*. 1960, Jan. 9, v. 185, 121–2, 2 figs.

Previous work [this *Bulletin*, 1937, v. 34, 559, 560] has suggested that each ovary of *Glossina* consists of a single ovariole, and that eggs are ovulated from right and left ovaries alternately.

Dissections of the ovaries of *G. morsitans* in 0·9% saline have now shown the presence of 2 ovarioles in each ovary. From the stage of development of each ovariole in 24-hour-old females, the author confirms that the eggs are produced alternately from right and left ovaries, but suggests that the 2 ovarioles in each ovary are used alternately as well. *B. R. Laurence*

PAUTRIZEL, R., LAFAYE, A. & DURET, J. Diagnostic sérologique de la maladie du sommeil. I. Amélioration de l'antigène préparé à partir de *Trypanosoma equiperdum*. [**Serological Diagnosis of Sleeping Sickness. I. Improved** *Trypanosoma equiperdum* **Antigen**] *Bull. Soc. Path. Exot.* 1959, May–June, v. 52, No. 3, 318–31. [29 refs.]

The authors point out that previous attempts to employ the complement-fixation test (CFT) for the diagnosis of sleeping sickness were unsuccessful, owing to the difficulty of preparing a pure antigen devoid of anti-complementary properties. Some years ago Belgian workers [this *Bulletin*, 1953, v. 50, 1023] developed a test in which *Trypanosoma equiperdum* provided the antigen. However, as it still contained red blood cells, the present authors sought to free it completely of impurities. With this end in view, the blood of rats heavily infected with trypanosomes was centrifuged and the blood cells were specifically agglutinated with anti-rat-erythrocyte immune serum of rabbit,

thereby producing an antigen free of impurities and devoid of anti-complementary power. The activity of this antigen was further increased by subjecting it to ultrasonic action, and it was demonstrated that its power was not diminished by preservation at −25°C. in glycerinated suspension for one year.

When sera of normal rabbits or those infected with organisms other than trypanosomes, as well as normal or syphilitic human sera, were tested with this antigen, the reaction was always negative, whereas it was invariably positive in the case of sera from patients suffering from sleeping sickness. The *T. equiperdum* antigen was thus shown to be quite suitable for the diagnosis of this disease by the CFT. *C. A. Hoare*

WEITZ, B. G. F. **A Soluble Protective Antigen of** *Trypanosoma brucei*. [Correspondence.] *Nature*. 1960, Mar. 12, v. 185, 788–9.

Sera from rabbits immunized against a virulent strain of *Trypanosoma brucei* contained an agglutinin for live trypanosomes and precipitins reacting with rat serum: after absorption with normal rat serum, there remained a precipitin reacting with a substance (termed "exoantigen") in sera from infected rats.

Antisera produced by rats to this exoantigen (after they had been injected with infected rat serum free from trypanosomes) and rabbit antibody induced by infection with washed living trypanosomes, both precipitated exoantigen and agglutinated living trypanosomes *in vitro*: exoantigen specifically inhibited this agglutination by both antisera. The similarity in immunological activity between antisera produced by infected rabbits and antisera induced in rats (and, in later experiments, rabbits) by injection of exoantigen was confirmed by gel-diffusion studies. It is concluded that the exoantigen is a product of the trypanosomes themselves and not of the host.

The exoantigen appears to assist in the preservation of viability, and hence infectibility, of trypanosomes maintained *in vitro* at room temperature for 1 or 2 hours. Electrophoretically, it is recognizable as a component of infected rat serum moving more slowly than the gamma globulin. Repeated injections of exoantigen actively immunize rats and mice to the homologous strain of trypanosomes.

[It is interesting to compare this work with the rather similar results obtained by THILLET and CHANDLER with *T. lewisi* (this *Bulletin*, 1957, v. 54, 1164).]
J. R. Baker

MERCADO, Teresa I. & VON BRAND, T. **Histochemical Studies of Liver Glycogen and Lipid in Some Parasitic Infections.** *J. Infect. Dis.* 1960, Jan.–Feb., v. 106, No. 1, 95–105, 8 figs. [18 refs.]

The authors have previously found in rats infected with *Plasmodium berghei* a depletion of liver glycogen and loss of ability to synthesize the substance, accompanied by increased lipid content [this *Bulletin*, 1954, v. 51, 1039; 1957, v. 54, 1392; 1958, v. 55, 1080]. Glycogen depletion also occurs in trypanosome infections of rats. Histochemical observations have been extended to the latter infection and to that of *Bartonella muris*. The trypanosomes used were *T. equiperdum*, *T. equinum* and *T. congolense*. The rat hosts weighed about 100 gm. and in the case of *B. muris* infection had been splenectomized some

days earlier. Counts of trypanosomes during infection were made in a haemocytometer and the progress of the *Bartonella* infection was followed on stained films. One group of animals was starved and another group starved and treated with meticortelone acetate as well. Two other groups received 250 mgm. fructose after starvation, or the sugar along with meticortelone; and two further groups were treated in the same way with 500 mgm. fructose. Normal rats and those infected with *T. equiperdum* and treated with sodium pyruvate were similarly studied. Conventional fixation techniques were used in tissue studies. The following is the authors' summary:—

"1. Histochemical studies showed a reduced glycogen synthesis of liver in trypanosome-infected animals (*Trypanosoma equiperdum*, *T. equinum*, and *T. congolense*) after the administration of fructose and/or meticortelone.

"2. Similarly, sodium pyruvate failed to induce glycogen deposition in *T. equiperdum*-infected livers.

"3. The histochemical pattern of glycogen deposition and lipid infiltration was not as regular as that previously observed in malarial infections.

"4. In bartonellosis, the histochemical picture resembled more that previously described for malaria, but in addition areas of necrosis were observed; these contained glycogen granules even when the surrounding nonnecrotic liver tissue was glycogen-free.

"5. It is concluded that every infection shows peculiarities in respect to glycogen and lipid as demonstrated by histochemical procedures. This seems to exclude the unspecific anoxia and adrenal involvement as the only factors responsible for the liver changes observed. It is possible that a specific influence originating from the parasite modifies the response of the liver to the above unspecific factors." *J. D. Fulton*

DESOWITZ, R. S. **Studies on Immunity and Host-Parasite Relationships. I. The Immunological Response of Resistant and Susceptible Breeds of Cattle to Trypanosomal Challenge.** *Ann. Trop. Med. & Parasit.* 1959, Sept., v. 53, No. 3, 293–313, 15 figs. [21 refs.]

The pathogenic African trypanosomes are characterized not only by a relatively wide host range but also by variations in the course of infection in diverse animals. Thus, in West Africa local breeds of cattle differ in their susceptibility to infection with *Trypanosoma vivax*, which produces severe and fatal infection in the Zebu breed, while the N'dama and Muturu breeds are highly resistant to infection. In the present paper an account is given of experiments on the immune reaction in these breeds of cattle to challenge with *T. vivax*. [Since little is known about immunity in sleeping sickness, the results obtained in this study of an animal parasite might throw light on the host-parasite relations in the human disease.]

The immune reaction in the bovines, challenged by cyclical infection with *T. vivax*, was studied by following the course of parasitaemia, the serum-protein pattern, and antibody titre. The antibody titre was assessed by a respiratory test, based on the observation that the oxygen consumption of trypanosomes suspended in immune sera decreases in proportion to the titre of the sera.

In these experiments the following facts were brought out. If animals of the Muturu breed (which are normally resistant to infection) have not been in contact with tsetse flies for many generations, the disease in them runs an acute course with progressive parasitaemia, terminating in death within a month after challenge. In Zebu cattle from a tsetse area, where they were exposed to infection as calves, infection is characterized by parasitic attacks and crises lasting 20–40 days, followed by a chronic state with scanty parasites, and terminating by apparent recovery. In N'dama cattle born and bred in a tsetse area, there was a hyperimmune reaction, the challenge producing scanty transient parasitaemia terminating in self-cure. On the other hand, if the descendents of such animals were born and reared in a tsetse-free area, the type of infection and immune response in them were similar to those in Zebu.

In discussing the results, the author points out that they seem to indicate that the immune response in the adult animal is influenced by the stimuli it receives as a calf, which are represented (a) by antibodies in the dam's colostrum and (b) by trypanosomes transmitted through tsetse. It would also seem that the resistant breeds differ from the susceptible ones in the nature of the secondary response after the animals had been sensitized as calves: N'dama are capable of maintaining a high antibody titre, whereas Zebu are not. There are indications that in challenged Zebu and partially immune N'dama the gamma globulin component of serum consists of two fractions, while in hyperimmune N'dama a third fraction is present. *C. A. Hoare*

De Figueirêdo, A. & De Figueirêdo, F. *Triatoma infestans* (Klug, 1834) em Pilar, Estado das Alagoas. [**The Finding of Specimens of** *Triatoma infestans* **(Klug, 1834) in Pilar, Alagoas (Brazil)**] *Anais Facul. Med. Univ. do Recife*. 1957, July, v. 17, No. 1, 107–10, 3 figs. on 2 pls. [20 refs.] English summary p. iv.

The English summary appended to the paper is as follows:—

"The *T. infestans* is a species of the States of the south of Brazil; it had not yet been recorded in the north of this country. The authors describe four specimens collected in one habitation at Pilar, Alagoas.

"All those insects presented white eyes, *i.e.*, a mutation phenomenon."

Deane, L. M. Novo hospedeiro de tripanossomos dos tipos *cruzi* e *rangeli* encontrado no Estado do Pará: o marsupial *Metachirops opossum opossum*. [**New Host of** *Trypanosoma cruzi* **and** *T. rangeli* **in the State of Pará: the Opossum** *Metachirops o. opossum*] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1958, Oct., v. 10, No. 4, 531–41, 29 figs. English summary.

Working in the State of Pará, Brazil, the author discovered a new host naturally infected with *Trypanosoma cruzi* and *T. rangeli*. These trypanosomes were recovered from 3 out of 5 opossums, *Metachirops o. opossum*, and were studied in blood films and heart smears of the mammalian host, while the invertebrate cycle of development was followed in nymphs of *Rhodnius*

prolixus, used in xenodiagnosis of the infections. One of the opossums harboured a mixed infection, and the other two had pure infections with each of these parasites. Various stages of these trypanosomes are depicted in figures and photomicrographs. *C. A. Hoare*

DEANE, L. M. Encontro de tripanossomo do tipo *rangeli* em gambás da espécie *Didelphis marsupialis marsupialis*, no Estado do Pará. [**Occurrence of *Trypanosoma rangeli* in Opossums in the State of Pará**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1958, Oct., v. 10, No. 4, 451–8, 17 figs. [36 refs.] English summary.

The author records the finding—for the first time in Brazil—of *Trypanosoma rangeli* in opossums, *Didelphys m. marsupialis*, which were examined by xenodiagnosis with nymphs of *Rhodnius prolixus* in forests of the state of Pará, Amazon Region. Out of 23 animals, one proved to be infected with *T. rangeli*, another with this species and *T. cruzi*, while 7 harboured only the latter. A study of the trypanosomes in blood films from the natural host and from mice inoculated with the faeces of infected bugs, as well as in stained preparations of the gut contents of the insect, showed that the parasite in question was indistinguishable from *T. rangeli*. The author recalls that in Venezuela *D. marsupialis* is regarded as a reservoir of this trypanosome.

The appearance of the trypanosome in the opossum and in the bug is shown in a series of figures. *C. A. Hoare*

TORRICO, R. A. Casuística de la enfermedad de Chagas por la reacción de fijación de complemento en cardíacos del Chaco (Argentina). [**Complement-Fixation Tests for Chagas's Disease in Cardiac Patients in Chaco, Argentina**] *An. Inst. Med. Regional*. Resistencia, Argentina. 1959, Dec., v. 5, No. 1, 79–81. French summary (7 lines).

37·5% of 575 sera were positive.

MAEKELT, G. A. Contribución para el estudio de la enfermedad de Chagas en Venezuela. Investigaciones serologicas de la enfermedad de Chagas mediante la reacción de fijación del complemento. [**Serological Investigations of Chagas's Disease in Venezuela with Complement-Fixation Test**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1959, July, v. 3, No. 1, 252–71. [42 refs.] English summary.

The high incidence of cases of chronic myocarditis in Venezuela seemed to point to Chagas's disease as the cause. In order to establish the aetiology of this condition and to determine the incidence of this disease, the author carried out 2,000 complement-fixation tests (CFT) with the sera from (a) hospital patients suffering from chronic myocarditis, (b) corpses, (c) blood donors, (d) blood of the umbilical cords of newborn infants, and (e) other sources.

The results were as follows. Among 200 unselected patients, 68 cases (34%)—mainly in 30–40 year age-group, many of whom showed signs of myocarditis—reacted positively to the CFT for Chagas's disease. In 381 sera from corpses there was a high degree of correlation between positive serological reactions and histopathological findings of myocarditis. Among the sera from 449 blood donors, 12% reacted positively in the CFT. In the case of sera from the umbilical cords of newborn infants, transmission of maternal antibodies was demonstrated by the CFT in 12 cases. Finally, among 83 samples of sera from the State of Guarico, 21 gave positive reactions. *C. A. Hoare*

MARQUES, R. J., TOMPSON, G., COSTA, E. G., CORDEIRO, E. & SALDANHA, R. Estudo eletrocardiográfico da Doença de Chagas em Pernambuco. [**Electrocardiographic Study of Chagas's Disease in Pernambuco**] *Anais Facul. Med. Univ. do Recife*. 1957, July, v. 17, No. 1, 73–9, 7 figs. on 3 pls. [30 refs.] English summary p. iii.

This study was made on 120 patients (86 men and 34 women) in 2 different physiographical zones of Pernambuco. Chagas's disease was diagnosed in all by complement-fixation tests, confirmed where possible by xenodiagnosis. Nearly two-thirds of the patients were aged 21 to 40 years. Abnormal electrocardiographic findings were observed in 90 (75%) and these are listed, described and illustrated in several tracings.

The most frequent findings were right bundle branch block (45·5%), primary ST and T alterations (40%), ventricular hypertrophy (15·5%), low voltage of the QRS complex (10%), complete auriculoventricular block (8·8%) and left bundle branch block (4·4%).

Premature beats were found in 23% of abnormal cases, and in 10% evidence suggesting old coronary occlusions; nearly half of these were confirmed at autopsy. *H. J. O'D Burke-Gaffney*

GALINDO V., S. Cardiopatía chagásica crónica. Primeros casos en el Ecuador, demostrados parasitológicamente. [**Chronic Cardiopathy in Chagas's Disease. First Cases in Ecuador demonstrated Parasitologically**] *Rev. Equatoriana de Hig. y Med. Trop.* Guayaquil. 1959, Jan.–Mar., v. 16, No. 1, 9–20, 6 figs.

PENHA, P. D., Jr. & KOEBERLE, G. Megaesôfago chagásico. Estudo quantitativo do plexo de Auerbach. [**Megaoesophagus of Chagas's Disease. A Quantitative Study of the Auerbach's Plexus**] *Rev. Goiana Med.* 1959, July–Sept., v. 5, No. 3, 185–92, 1 graph. [22 refs.] English summary.

[See this *Bulletin*, 1960, v. 57, 571, 572.]

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

MANSON-BAHR, P. E. C., HEISCH, R. B. & GARNHAM, P. C. C. **Studies in Leishmaniasis in East Africa. IV. The Montenegro Test in Kala-Azar in Kenya.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Sept., v. 53, No. 5, 380–83. [10 refs.]

The Montenegro test is a skin sensitivity reaction to an antigen prepared from a culture of *Leishmania braziliensis* on NNN medium. It is highly specific in South American muco-cutaneous leishmaniasis and will detect even sub-clinical infections. The reaction is negative in Brazilian visceral leishmaniasis, and is said to be so also in kala azar.

The test is performed by injecting intradermally 0·05 ml. of antigen (that used in this study was Pessoa antigen supplied by Professor M. P. BARRETTO); the inoculation site is examined at 24, 48 and 72 hours and the result is only considered positive if local induration lasts for 72 hours.

4 East Africans from the Kitui district of Kenya who showed post-kala-azar dermal leishmaniasis after treatment of the disease acquired in the recent epidemic [the *Bulletin*, 1955, v. 52, 520], were subjected to this test: 3 gave positive reactions. It was therefore decided to carry out the reaction in a further series of patients suffering from active East African kala azar, or who had recently recovered from it. All 15 patients surprisingly showed positive reactions. In order to prove that this was not a non-specific response, 5 patients who had never been exposed to kala azar were tested. 4 out of 5 gave negative reactions, the only false positive being in an adult male showing hepato-splenomegaly due to chronic *Schistosoma mansoni* infection.

The authors hold that the occurrence of positive Montenegro reactions in East African kala azar suggests that this form of the disease (and presumably the related Sudanese form [*ibid.*, 1941, v. 38, 261]) is due to a race of *L. donovani* biologically different from that causing Indian and Brazilian kala azar. The test should clearly prove to be an important weapon in epidemiological surveys in East Africa, where it should reveal latent, active and cured examples of the disease. *J. H. Walters*

DE OLIVEIRA, C. A., BATISTA, S. M. & LIMA FALCÃO, Alda. Calazar em Minas Gerais. Revisão dos dados epidemiológicos obtidos até 1958. **[Visceral Leishmaniasis in Minas Gerais, Brazil]** *Hospital.* Rio de Janeiro. 1959, Oct., v. 56, No. 4, 625–43, 1 map. [Numerous refs.] English summary.

The authors survey the position in the state of Minas Gerais from 1947–1958, but although only 57 autochthonous cases are reported they mention that this does not represent the true incidence as many are confused with chronic malaria and with the hepato-splenic form of *Schistosoma mansoni* infections. The first proved autochthonous case was diagnosed in the state in 1943 [this *Bulletin*, 1944, v. 41, 193].

In 1958 dogs were found to be infected with *Leishmania donovani* in many parts of the state while investigations showed that the north-east was an

important focus of human kala azar, though 2 other foci have also been found. Of the 57 cases, most were diagnosed by splenic or sternal puncture and a few by the complement-fixation test. The age-groups most affected were 0–4 (16 patients) and 20–29 (11). 46 were males.

Although in a neighbouring state foxes have been found sporadically infected, in Minas Gerais dogs seemed to be the most important reservoir, so surveys were carried out to ascertain the incidence of those naturally infected by means of the CF test (with an antigen made up from *Mycobacterium tuberculosis*) and smears made from snips of the dogs' ears and from various biopsies. The CF test is the method of choice as it is highly sensitive and may be positive before Leishman-Donovan parasites are detected.

Between 1956 and 1958, 2,096 dogs were examined; 113 were CF positive, 42 L-D positive. Dogs were found naturally infected in 6 towns where human cases had been reported. The principal vector is considered to be *Phlebotomus longipalpis*. It has been captured in or near houses in which there were human infections, but has also been found in a wild form in certain limestone caves. It was not found in one town which had a high human incidence and the authors consider that the roles of *P. cortelezzii* and *P. intermedius* should also be investigated, while *P. whitmani* may also be suspect. *W. K. Dunscombe*

MEDINA, R. & ROMERO, J. Estudio clínico y parasitológico de una nueva cepa de leishmania. [**Clinical and Parasitological Study of a new Strain of** *Leishmania*] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1959, July, v. 3, No. 1, 298–326, 16 figs. [38 refs.] English summary.

The authors describe a strain of *Leishmania* found at different times in 3 patients from the States of Yaracuy, Lara and Miranda of Venezuela, respectively. In one of them multiple nodules—some ulcerated—were present on the ear, in the other two almost the entire body was covered with papular, nodular or infiltrated lesions. Only minor lesions were present in the nasal mucosa, while the oral mucosa was normal in all these cases. The health of the patients throughout the period of infection (7, 9 and 20 years respectively) appeared to be unimpaired, and there were no signs of visceral involvement. The course of the disease was characterized by alternating periods of cutaneous eruptions and their temporary healing. The Montenegro skin reaction was usually weak or negative.

Smears from the lesions revealed numerous parasites, which were also found in apparently healthy skin and in the peripheral blood. They were represented by rounded forms (average size 3·85μ) with a large kinetoplast and an axoneme. Inoculation of animals with parasites from human lesions or cultures failed to infect guineapigs, rats, pups, rabbits and armadillo, but were infective to mice, a monkey and especially to hamsters, in which inflammatory nodules, developing into ulcers, with abundant parasites, were produced. None of the experimental animals had visceral involvement.

The parasite in question differs from *L. braziliensis* in the following features: (a) its abundance in lesions; (b) distinct antigenicity and (c) clinical picture produced; (d) failure to react to skin test, (e) lack of response to specific drugs, and (f) high infectivity to hamsters. Because of these differences the parasite is referred to as a new subspecies, *L. braziliensis pifanoi*.

The appearance and histopathology of the lesions in man and hamsters are shown in a number of illustrations. *C. A. Hoare*

CONVIT, J., ALARCÓN, C. J., MEDINA, R., REYES, O. & KERDELL VEGAS, F. Leishmaniasis tegumentaria difusa. Nueva entidad clínica-patológica y parasitaria. [**Leishmaniasis Tegumentaria Diffusa: a New Nosological Entity**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1959, July, v. 3, No. 1, 218–51, 31 figs. English summary.

The authors describe a new type of cutaneous leishmaniasis occurring in Venezuela, which differs from other forms of this disease in its clinical, pathological, immunological, parasitological and other characters. It is therefore regarded as a distinct nosological entity for which the name "leishmaniasis tegumentaria diffusa" is proposed.

The initial skin lesion appears in the form of a localized ulcer, plaque or nodule. The next phase is characterized by the appearance of skin eruptions in the form of flat patches on the back. As their distribution follows that of the vascular system, it is thought that they are spread through the blood vessels. These patches become progressively infiltrated and are finally transformed into nodules, which cover practically the whole skin surface, except the scalp, producing the appearance seen in lepromatous leprosy. On the other hand, the oropharynx is not involved, but there is a slight infiltration of the nasal mucous membrane around the lower septum. From the point of view of histopathology, the lesions are characterized by granulomata consisting of mononuclear cells with vacuoles containing Leishman-Donovan bodies. The parasites are also abundant in smears of skin lesions and can be found in sediments of blood obtained by venipuncture: they differ from typical *Leishmania braziliensis* in larger dimensions (5–7μ). The parasites can be readily cultivated in NNN medium and are infective to hamsters, in which they produce nodules with numerous L-D bodies. As regards treatment, the usual chemotherapeutic agents produced only temporary improvement in the patients' condition. Immunologically the disease is characterized by negative Montenegro reaction.

A detailed account is given of 4 cases of the disease, with numerous illustrations depicting the lesions and their histopathology. *C. A. Hoare*

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

STEYN, J. J., DE BEER, J. J., GREEFF, J. G. & COETZEE, W. L. **Resistance of the Body Louse (*Pediculus humanus corporis* de G.) to DDT Powders.** *South African Med. J.* 1960, Jan. 30, v. 34, No. 5, 90–92.

In the world-wide survey of susceptibility levels of body lice to insecticides, WRIGHT and BROWN [this *Bulletin*, 1957, v. 54, 943] noted that tests in South

Africa had indicated the highest levels of DDT resistance. The present paper describes further tests with the same technique in various Bantu locations in South Africa. Definite indications of high level resistance were apparent in some areas, as shown by considerable proportions of lice surviving 24 hours on 5% DDT dust. The resistance levels were highest in areas where most DDT dusting had been done.

Despite these results of tests, it was found that all the lice could be killed by thorough DDT dusting, even in dwellings from which the specimens showing high resistance had been collected. *J. R. Busvine*

GENIG, V. A. **The Influence of Cortisone on the Course of Rickettsial Infection induced in Guinea-Pigs by the Breinl and E Strains.** *Problems of Virology*. London. 1959, v. 4, No. 1, 83–7. [Translated from Russian.]

Guineapigs treated with cortisone and inoculated with the Breinl strain of *Rickettsia prowazeki* reacted to the infection with a shorter incubation period and a longer febrile period than did untreated animals. Animals treated with cortisone showed no scrotal reaction. In contrast, intensification of the infection in cortisone-treated animals inoculated with the E strain only occurred when large doses (10^{-1}–10^{-2} dilutions of yolk sac suspensions) were given, and even then was relatively slight. "The experiments showed that the pathogenicity of the E strain of *R. prowazeki* is considerably decreased and the ability of the strain to produce an inapparent infection seems to be stable."

R. S. F. Hennessey

SCOTT, V. C. **Q Fever in Lebanon. Report of Two Cases.** Reprinted from *Lebanese Med. J.* 1957, May, v. 10, 188–200, 3 figs.

ROMAÑA, C., ROLDÁN, L., TORRICO, R. A. & MAYER, H. F. Acerca del primer caso agudo de fiebre "Q" en el hombre diagnosticado en la Argentina. **[First Acute Case of Q Fever in Man diagnosed in Argentina]** *An. Inst. Med. Regional.* Resistencia, Argentina. 1959, Dec., v. 5, No. 1, 23–8, 2 figs. English summary (6 lines).

MAYER, H. F., TORRICO, R. A., ROMAÑA, C. F. & DE MENDOZA, A. C. Comprobaciones serológicas y alérgicas de fiebre "Q" en el Chaco (Argentina). **[Serological and Allergic Tests for Q Fever in El Chaco (Argentina)]** *An. Inst. Med. Regional.* Resistencia, Argentina. 1959, Dec., v. 5, No. 1, 29–35. English summary.

The authors have carried out complement-fixation, and microagglutination tests; for the latter they used 2 antigens, one from *Rickettsia burneti* and the second from a neorickettsia. They also carried out a sensitivity test by

injections into the lower eyelid of 0·2 ml. of the same antigen used for the CFT. The tests were performed on the following:—

(a) 75 randomly selected human sera. Here the CFT was positive at 1 in 16 or more in 13 sera; 2 out of 7 sera were positive by the micro-agglutination method.

(b) 11 pigs. 1 CFT was positive; 3 out of 9 sera were positive by micro-method for neorickettsia but not for *R. burneti*.

(c) 19 dogs. 18 CFTs were positive; all animals were positive to the eyelid test; 3 out of 7 were Q positive by the micro-method and 5 out of 7 were positive to the neorickettsia antigen (2 positive to both antigens).

(d) 112 cattle. 56 CFTs were positive. The eyelid test on 54 milking cows gave 22 positive results and 3 out of 8 calves were also positive. The micro-method on 15 bovine sera gave 2 Q positive, 9 neorickettsia positive, 1 positive to both.

The authors consider that these results definitely indicate that there is now a serious anthropozoonosis problem in Argentina. *W. K. Dunscombe*

Soběslavský, O. & Syrucek, L. **Transovular Transmission of *C. burneti* in the Domestic Fowl** (*Gallus gallus domesticus*). *J. Hyg., Epidemiol., Microbiol. & Immunol.* Prague. 1959, v. 3, No. 4, 458–64, 1 fig. [22 refs.]

Rickettsia burneti was recovered by guineapig inoculation from 14 out of 36 suspensions of pooled yolk sacs (each suspension made up of 2 or 3 sacs) from eggs laid by 8 hens which had been infected orally with *R. burneti*. Suspensions of spleen and liver from 3 out of 14 chicks hatched from eggs laid by the same hens also yielded *R. burneti*. All the infected yolk sacs and chicks were from eggs laid between the 26th and 64th day after infection of the hens. *R. burneti* was isolated from the spleen of 1 of 2 hens killed 1 year after infection; sera from both hens had given negative complement-fixation tests for antibodies to *R. burneti*. Finally, *R. burneti* was recovered from eggs laid by hens which were the progeny of those originally infected; the ovaries of 1 out of 3 of these second-generation hens killed 8 months after hatching yielded *R. burneti*.

While these results show that *R. burneti* can be transmitted in the eggs of infected birds, producing infection in the next generation, the authors think that "the domestic fowl has no great epidemiological and epizootological significance in the spread of Q fever, except perhaps in exceptional circumstances, as in an active focus of the infection". *R. S. F. Hennessey*

BARTONELLOSIS

See also p. 688, Mercado & Von Brand, **Histochemical Studies of Liver Glycogen and Lipid in Some Parasitic Infections.**

Arevalo, G. M. & Castañeda Cabada, C. Infección salmonelósica en el curso de la verruga peruana. [*Salmonella* **Infection during Verruga Peruana**] *G.E.N.* Caracas. 1959, July–Dec., v. 14, Nos. 1/2, 53–60, 3 figs. [20 refs.]

A general account and review of the literature.

Cuadra, M. Tratamiento con cloramfenicol de casos de Bartonellosis aguda (Enfermedad de Carrión) en período de inicio. [**Treatment of Acute Bartonellosis in the Initial Stage with Chloramphenicol**] *An. Facul. de Med.* Lima. 1957, v. 40, No. 3, 747–72, 5 charts & 2 figs. [29 refs.] English summary.

After reference to previous studies on the use of chloramphenicol in bartonellosis [this *Bulletin*, 1952, v. 49, 40; 1953, v. 50, 106; 1955, v. 52, 1072] the author, from Lima, Peru, describes in very great detail his treatment of 4 patients in the early stage of this disease, when fever, slight anaemia and scanty bacillary infection were present.

The dosage varied with each patient, but was usually about 2–3 gm. every 24 hours, in divided doses for 2 to 7 days; in the last few days the dosage was sometimes lower than this.

The results were very satisfactory: pyrexia disappeared and *Bartonella* were no longer seen in the peripheral blood in 24 to 48 hours. The characteristic severe anaemia did not occur. One patient relapsed but a second course of treatment was effective.

The author discusses the results at great length with special reference to the various stages of the disease and the importance of beginning treatment in the early stages. He emphasizes the additional value of chloramphenicol in preventing or dealing with the frequently severe and often fatal *Salmonella* infections which may complicate Oroya fever.

H. J. O'D. Burke-Gaffney

YELLOW FEVER

Collier, W. A. & De Wit, M. J. **Adsorption to Ascites Cells and Eclipse Phenomenon of Yellow Fever Virus in Ascites-Carcinoma.** *Trop. & Geograph. Med.* Amsterdam. 1959, Dec., v. 11, No. 4, 339–44, 6 graphs.

The authors [this *Bulletin*, 1960, v. 57, 360] have shown that 17D yellow fever virus can be subcultured in Krebs-2 ascites tumour in mice for more than 1 year. In the experiments described here, mice with about 10 ml. ascites were inoculated with virus and the fluid sampled and titrated intracerebrally in mice at intervals. With 17D the titre dropped from about 4·2 log LD50 to 2·7 log 2 minutes later and remained at this level for 24 hours after which it rose to 4·7 log on the 4th day, then fell again. With Asibi neurotropic yellow fever the titre dropped from about 8·4 log [over 8·5 log in figure] to 6·4 log after

6 days, with a hump in the curve on the second and third days [but the appearance is of a slow progressive fall in titre]. Experiments were made with the adsorption of virus to ascites cells *in vitro* [the differences between cell-adsorbed suspensions and controls do not appear significant] and the drop in titre was less than *in vivo* with 17D. The fluid and cells disintegrated by freezing and thawing were titrated in parallel in an experiment with 17D: in the fluid the titre fell from 4·0 log to 2·6 log after 48 hours; in the cells the initial titre was the same and fell to 2·5 log after 2 hours, rising to 3·7 log after 24 hours. In an experiment where the cells were ground up in sand the titre fell from 4·5 log to 3·3 log in 2 minutes and remained about this level for 48 hours.

[The evidence presented, although suggestive, does not appear to have demonstrated clearly the eclipse phenomenon—the complete loss of infectivity of virus after adsorption into a cell followed by later appearance of new virus.]

C. E. Gordon Smith

World Health Organization. Technical Report Ser. No. 179. **Requirements for Biological Substances. 3. Requirements for Yellow Fever Vaccine. 4. Requirements for Cholera Vaccine. Report of a Study Group. Geneva, 1–6 September 1958.** 46 pp. [Refs. in footnotes.] 1959. Geneva: Palais des Nations. [Sales agent for U.K., H.M. Stationery Office.] [1s. 9d.; $0.30; Sw.fr. 1.–.]

This report contains detailed recommendations for every stage in the preparation of these vaccines, their standardization, testing, storage before despatch to users, transportation and finally storage by the user prior to vaccination. In the case of yellow fever vaccine it is specially important that there should be a very full and accurate system of record-keeping at every stage of each batch prepared. The full reports of safety and potency tests in animals should always be readily available for future reference when the protective efficiency is checked in persons after vaccination.

While the antigenicity and protective power of the yellow fever vaccine can be assessed with accuracy by *in vivo* methods, only the antigenicity of the cholera vaccine can be measured at the present time, and pending the development of a more satisfactory method of assessing the protective value of cholera vaccine no other method is recommended: but proposed new potency tests are described in an appendix, and field trials are recommended.

H. J. Bensted

DENGUE AND ALLIED FEVERS

Henderson, J. R. & Taylor, R. M. *Phlebotomus* **(Sandfly) Fever Viruses in Tissue Culture.** *Amer. J. Trop. Med. & Hyg.* 1960, Jan., v. 9, No. 1, 32–6, 3 figs. [13 refs.]

3 Naples and 2 Sicilian strains of phlebotomus fever virus were used. They had undergone 14–48 mouse passages. Trypsinized mouse and human kidney

cultures were prepared in the usual way, mouse kidney yielding about $3{\cdot}6 \times 10^7$ cells per gm. of kidney. Both types of virus multiplied in both types of cell. Plaques formed in human kidney cultures after about 23 days; in these cultures $10^{3{\cdot}2}$ plaque forming units were equivalent to $10^{5{\cdot}9}$ infant mouse LD50. 3 or 4 tissue culture passages were needed for some strains before cytopathic effects were found in human kidney, but with mouse kidney cytopathic effects were usually apparent in the first passage. Peak titres of virus in the cultures were reached 2–3 days after inoculation. The infectivity half-life of these viruses in cell-free tissue culture medium at 35–37°C. was about 6 hours. Mouse kidney yielded virus titres only about 1 log less than infant mice; passage in culture seemed to increase the titres of a Sicilian but not of a Naples strain. After 6 passages in tissue culture the virus was identified serologically. *C. E. Gordon Smith*

RABIES

FENJE, P. & AMIES, C. R. **The Problem of Rabies in Canada.** *Canadian Med. Ass. J.* 1960, Jan. 30, v. 82, No. 5, 243–5.

In Canada between 1906 and 1950 outbreaks of rabies, mainly among dogs and rarely among farm animals, had occurred only in the thickly populated part of the country south of the 54th parallel, the infection having been introduced from adjacent areas of the United States, where the disease was in evidence at the same time. These outbreaks, in which wild life was never known to be involved, had been readily brought under control by measures directed against the dog population: tie-up orders, quarantine and compulsory vaccination. In 1951, however, it was established that rabies was enzootic throughout the entire North West Territories and that the reservoir of infection was wildlife. By 1952 the disease had begun its spread southwards, and thereafter its progressive invasion of those parts of the provinces south of the 60th parallel was reflected in the sharp rise in the incidence of rabies among the domestic animals and wildlife there. Thus, of the 2,242 cases (2,190 in Ontario Province) of animal rabies confirmed by laboratory examination in the 8-month period 1 April 1958—1 January 1959, the species distribution was: foxes 1,066 (47·5%), cattle 756 (33·2%), skunks 101 (4·5%), cats 96 (4·3%), sheep 91 (4·1%), dogs 71 (3·2%), horses 30 (1·3%) and other animals 31 (1·3%).

The extent of the present enzootic and the problem it presents to Canada have already been fully stated by PLUMMER [this *Bulletin*, 1954, v. 51, 1238], WELLS [*ibid.*, 1957, v. 54, 1176] and EDGE [*ibid.*, 1959, v. 56, 1229], but in the article now published a suggestion of particular interest is made with respect to the strain of virus affecting the wildlife of Canada today. There is strong evidence that this strain of virus has low pathogenicity for man. If this were not so there would have been at least a few clinical cases of rabies among persons exposed to infection. Support is lent to the suggestion by the records in Ontario: among 83 persons, who had been bitten, several severely, by

animals proved to have been rabid at the time of biting, there was no failure of vaccine treatment. Moreover the very low fatality incidence in dogs also favours the suggestion, because many of the farm dogs in the affected areas have not been vaccinated. In the circumstances, if the suggestion is correct, a human infection would probably be clinically atypical and the correct diagnosis might be missed, unless a very thorough virological examination were carried out. In the authors' view the pathogenicity of the Canadian wildlife strain resembles that of the African strain of *Oulou Fato* in its low degree of virulence for man.

[Strains of rabies virus encountered in the natural or street virus differ from each other in degree of virulence, as well as in other characters. Nevertheless, together they form a complete antigenic community, whatever their origin, from the highly virulent viruses to the African strains of *Oulou Fato*, the invasive power of which is so attenuated that it is rarely pathogenic for man.]

It is stated in a footnote that a fatal human case of rabies has been reported in Ontario and will be published later. *G. Stuart*

Cocozza, J. & Roman, J. Estudio sobre la rabia en la frontera Mexicano-Estadounidense. [**Rabies on the Frontier between Mexico and the United States**] *Bol. Oficina Sanitaria Panamericana.* 1960, Jan., v. 48, No. 1, 21–32. [24 refs.]

After a brief historical note on the introduction of rabies into the Americas, the authors discuss the problem of this disease on the Mexico-United States frontier. Canine rabies is easily established in these two countries because of the presence of feral reservoirs such as coyotes, wolves, foxes, and, more recently, skunks. A table showing the incidence of rabies in animals in the Americas indicates that most notifications were in the United States (4,814 in 1958, the next highest being 433 for Argentina). Unfortunately no comparable statistics were available for Mexico.

The frontier extends for 1,452 miles from east to west and the adjacent populations amount to 2·64 million persons. Calculation of the number of dogs is impracticable, but the figure of 1 dog per 10 persons in the rest of the United States probably applies. Movement across the frontier is unparalleled in any country; in 1957 some 75 million people crossed from the U.S. into Mexico of whom 28 million did so at the frontier between Ciudad Juárez and El Paso, where the greatest movement takes place. Many dogs accompany these people and in general there is no effective barrier to dogs. Rabies is present throughout this area. Thus there is a serious public health problem requiring close cooperation between the two countries. A table shows that in 1958 there were 358 cases of animal rabies in Texas, 189 in California, 30 in Arizona and 6 in New Mexico. The incidence, reservoirs, and control in each of those states are described fully and supported by many tables. The presence of rabies in bats in California and Arizona is noted and the species listed. Particular attention is given to the problem at the point of greatest movement; there is constant traffic across it and since the River Bravo is dry during a great part of the year dogs can easily pass between El Paso and Ciudad Juárez.

The position on the Mexican side of the border is dealt with similarly. In 1957 there were 31 cases of rabies in 17 of the 29 states. Between 1953 and 1957 there was an average of 29 deaths from rabies in man. Control of rabies on the frontier is discussed. The main object is to reduce the incidence in domestic animals and this requires control of the feral reservoirs, including bats. Intensive measures are carried out to destroy wild animals. The substitution of the coyote by the skunk as the principal reservoir in the more populated areas has introduced a new epidemiological problem.

Although animal rabies is a self-limiting disease (since all the vectors die of it eventually), it cannot be expected to be eradicated by itself. Rapid elimination by the best available methods of control is required.

H. J. O'D. Burke-Gaffney

HUYGELEN, C. Note au sujet du titre d'anticorps neutralisants dans le sérum d'une personne ayant subi deux vaccinations antirabiques. [**Note on the Titre of Neutralizing Antibody in the Serum of a Person after Two Courses of Treatment with Antirabies Vaccine**] *Ann. Soc. Belge de Méd. Trop.* 1959, Oct. 31, v. 39, No. 5, 775–6. [11 refs.]

In the case reported in this paper the person at risk had received a second course of vaccine treatment one year after completion of the first. Vaccine of the 5% Semple type had been administered, in a daily dosage of 5 ml., on 20 days during the first course and on 5 days during the second. The sample of serum investigated was obtained 5 months after the last injection of the second series.

Results of serum-virus neutralization tests showed the difference in the logarithms of the titre of the virus in the control serum and the titre of the virus in the serum under investigation (PS) to exceed 4—the neutralization index of the PS being, therefore, about 30,000.

In his comments on this finding the author refers to the results obtained by other workers, who have investigated the re-stimulation of immunity induced in man by a previous course of antirabies vaccine. LEBELL *et al.* [see this *Bulletin*, 1950, v. 47, 845] found, in the sera of their treated patients, a much higher antibody response to a second series of injections than to a first: 4–5 weeks after a single course of treatment the neutralization index averaged 7,780, as compared with one exceeding 31,600 (in 2 persons) and 63,100 (in a third person) after a second course. As regards the duration of immunity conferred by antirabies treatment: a study by Fox *et al.* [*ibid.*, 1958, v. 55, 753] of the recipients of such treatment indicated that antibody persists longer (for 15 or more years) after a second course than it does (for some 5 years) after a single course.

Finally the relation between immunity and the titre of neutralizing antibody is discussed.

[As regards the relationship between virus neutralizing antibodies and protection against rabies, the WHO Expert Committee on Rabies (*ibid.*, 1957, v. 54, 809) considers that, although "resistance to actual infection following vaccine prophylaxis is based on other immunological factors, as well as the presence of antibodies in the blood . . . immunity in man, other than that

assessed by actual post-exposure field trial . . . can be estimated at present only through the presence of neutralizing antibodies in his blood ".]

G. Stuart

MARTIN, G. A. El control de la rabia en Texas. **[Control of Rabies in Texas]** *Bol. Oficina Sanitaria Panamericana.* 1960, Jan., v. 48, No. 1, 33–5.

The author writes from the Division of Veterinary Public Health in Texas. Hitherto, control of rabies in Texas had been sporadic and circumscribed: many of the people did not attach much importance to it until confronted with an outbreak. Fortunately many public health and local authority administrators maintain continuous control measures. Most cities have legislation for the vaccination of dogs, but some are not always vigilant in observing them. In 1955, the State legislature promulgated an ordinance empowering county authorities to institute control measures if the public health authorities declared that an epidemic existed. Control activities have increased recently, because in recent months there have been more cases of rabies and public health veterinarians have travelled throughout the State advising local authorities.

The increase in cases in the first trimester of 1959 compared with the same period in 1958 is attributed to the increase in the number of rodents and other small animals, because of an abundance of food: these in turn attract the fiercer animals. Figures for incidence in different animals are given.

The disease is endemic throughout the State. Canine rabies predominates in the larger cities, and feral rabies in other areas. In 1959 there were reports of rabies in pigs.

Methods of control are described, principally immunization of dogs, control of stray dogs and reduction of feral reservoirs. These vary according to area and cooperation and there have been successes and difficulties. Examples are given and these include the case of a large city in which vigorous control measures reduced the incidence of rabies in dogs from several hundred cases a year to nil; the following year control was relaxed and the incidence of rabies increased enormously. Another city pursued a sustained programme, with cooperation from local authorities, press, radio and public and has eliminated rabies. Control has been relaxed in some areas because of the high cost. The question is discussed whether a fee should be charged for dog licences, thus increasing the fund available for control measures. It is suggested that a free licence produces better results. An example is quoted of a city which increased the registration fee, with the result that the control programme soon came to an end. As elsewhere a continuous and extensive educational programme is required if rabies is to be controlled.

H. J. O'D. Burke-Gaffney

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

FINKELSTEIN, R. A. & LABREC, E. H. **Rapid Identification of Cholera Vibrios with Fluorescent Antibody.** *J. Bacteriology.* 1959, Dec., v. 78, No. 6, 886–91. [15 refs.]

The fluorescent antibody technique has been applied by a number of workers to the experimental identification of various bacteria and viruses and the investigations described in this paper are concerned with the application of the method for the rapid identification of cholera vibrios in human stools.

Both cholera group- and type-specific antisera were conjugated with fluorescein isothiocyanate and in addition to the examination of the various culture preparations stained with conjugated antisera, direct smears of similarly treated artificial cholera stools were also included. The artificial cholera stools were prepared by making a suspension of human faeces in saline and adding a suitably diluted suspension of cholera vibrios. Similar preparations were also made from faecal specimens of normal guineapigs and also guineapigs experimentally infected with cholera.

There was no difficulty in identifying the specifically stained cholera vibrios when they were present in very large numbers, but when their concentration was less than 10^7 per ml. there was a possibility of non-specific reactions confusing the issue. If, however, the artificial cholera stool was inoculated into alkaline peptone broth, a recognized selective medium, it was found that stool suspensions containing as few vibrios as $2{\cdot}5 \times 10^2$ per ml. yielded, within 9 hours' incubation, cultures that gave with certainty the specific staining reaction. *H. J. Bensted*

JENKIN, C. R. & ROWLEY, D. **The Importance of Antibody in the Prevention of Experimental Cholera in Rabbits.** *Brit. J. Exper. Path.* 1960, Feb., v. 41, No. 1, 24–30. [17 refs.]

The authors employed the rabbit ligated-ileum-loop technique [this *Bulletin*, 1960, v. 57, 242] to show that the usual positive reaction that follows the injection of actively growing cholera vibrios into ileal loops of normal rabbits does not occur if the animals are immunized previously with a heat-killed cholera vaccine. Similar results were obtained in rabbits passively protected with relatively large doses of high titre anticholera serum. This protection was specific, for similar high titre serum prepared against a water vibrio did not prevent the development of a positive loop reaction and it would appear that the antibody against the lipopolysaccharide component of the O somatic antigen is concerned in this protection.

Further experiments indicated that antibody was present within the lumen of the gut of the actively immunized rabbits and that the cholera vibrios injected into the lumen were sensitized by this antibody so that they could be ingested by the macrophages in the exudate and killed. When weanling

rabbits were given injections into the small intestine [*ibid.*, 1955, v. 52, 974] of a rapidly growing broth culture of cholera vibrios which had been pre-sensitized by the addition of antibody (in a dose which itself was non-bactericidal) they survived. The controls receiving a similar dose of unsensitized vibrios were all dead within 72 hours. The results suggest that the important defence mechanism of the gut in these experimental cholera studies concerns both antibody and macrophages. *H. J. Bensted*

See also p. 699, WORLD HEALTH ORGANIZATION. TECHNICAL REPORT SER. No. 179. **Requirements for Biological Substances. 3. Requirements for Yellow Fever Vaccine. 4. Requirements for Cholera Vaccine. Report of a Study Group. Geneva, 1–6 September 1958.**

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

SCHENSNOVICH, V. B. [**Interrelation between the Morphology of** *Entamoeba histolytica* **and the Functional Condition of the Large Intestine**] *Med. Parasit. & Parasitic Dis.* Moscow. 1959, v. 28, No. 5, 594–7, 5 figs. [In Russian.]

The parasitological diagnosis of amoebic dysentery is based on the finding in the patient's stools of trophozoites of *Entamoeba histolytica* containing ingested erythrocytes, representing the tissue forms of the parasite. However, during the quiescent period of the disease preceding a relapse, haematophagous amoebae may be absent and the faeces reveal only lumen forms or cysts, like those discharged by healthy carriers. In such cases it may be difficult to determine whether the disease in the patient runs a symptomless course or if he is a healthy carrier.

In this paper a lucid account is given of the functional state of the normal and diseased large intestine in relation to the pattern of amoebic infection. In a normal large intestine the caecum and ascending colon are filled with liquid digested food masses, which are periodically introduced from the small intestine. As the contents of the colon move backwards they acquire a dense consistency and are discharged as formed stools.

In healthy carriers *E. histolytica* lives in the lumen of the caecum, where the amoebae (known as "minuta" forms, etc.) feed and multiply in its fluid contents. In the unfavourable conditions of the lower region of the colon the amoebae give rise to precystic forms and finally to cysts, which are discharged in the stools. However, when the normal function of the large intestine in healthy carriers is disturbed, with the result that its contents are more rapidly evacuated in unformed stools, the amoebae have no time to complete their life cycle and are discharged as trophozoites.

The invasion of the gut wall by *E. histolytica,* with the resultant ulceration, leads to the production of a pathological exudate that mixes with the fluid faeces, the discharge of which becomes more frequent. Under these conditions the trophozoites flourish, invading the tissues and ingesting red blood cells. The appearance of haematophagous amoebae in stools provides direct evidence of amoebic dysentery. However, on abatement of the pathological process an equilibrium is established between host and parasite, with the result that the lesions may be restricted to the proximal part of the gut, while the rest of it functions normally with the production of formed stools. In such cases the parasite behaves as in healthy carriers, producing cysts that are discharged with the faeces. But if the intestinal function is slightly disturbed, and the stools become semi-formed or soft, the patient will pass trophozoites of the "minuta" or precystic form. Thus both patients in the latent period or in mild forms of amoebiasis, as well as healthy carriers, will be passing trophozoites and cysts of *E. histolytica.*

From the foregoing account it is evident that the parasitological diagnosis of amoebic dysentery can be made only on the basis of the finding of tissue forms of *E. histolytica* containing ingested red cells. These provide evidence of amoebic lesions in the gut wall, whereas the finding of precystic forms and cysts is of no diagnostic value.

The paper is illustrated by a series of diagrams clearly illustrating the correlation between conditions in the gut and the amoebic infection. *C. A. Hoare*

MEEROFF, M. Modalidades clínicas de la amibiasis. [**Clinical Varieties of Amoebiasis**] *G.E.N.* Caracas. 1959, July–Dec., v. 14, Nos. 1/2, 95–100.

DE ZOYSA, M. H. & DE SILVA, C. C. **A Case of Amoebic Granuloma of the Caecum with an Acute Appendicular Abscess in Early Infancy.** *J. Trop. Pediatrics.* London. 1960, Mar., v. 5, No. 4, 118–20, 1 fig.

JAYARATNE, Susantha & DE SILVA, C. C. **A Perforated Amoebic Liver Abscess with Empyema in a Child of 2 Years.** *J. Trop. Pediatrics.* London. 1960, Mar., v. 5, No. 4, 115–17, 1 fig. [13 refs.]

RAVINA, A., JOSEPH, A. & COHEN, W. [**Fatal Amoebiasis in Infancy**] *Harefuah.* Jerusalem. 1960, Mar. 1, v. 58, No. 5 [in Hebrew 155–6. (15 refs.) English summary 157].

The English summary appended to the paper is as follows:—

"This article describes 5 fatal cases of amoebiasis in infants aged 4 years, 18 months, 11 months, 18 months and 12 months. The first four patients died of generalized peritonitis as a result of perforation of amoebic ulcers in the colon. The fifth child died of liver abscess.

"The literature concerning amoebic colitis and amoebic liver abscess in infancy is reviewed, and the insidious progress of the hepatic complication is stressed.

"The discussion points out the possibility that infants are infected directly by the mother or other members of the family who are carriers of amoebae.

"The conclusion should be that the treatment of amoebiasis must include the whole family and not only the patient."

MARETIC, Z. Traitement de l'amibiase et d'autres affections intestinales par l'Entobex. **[Treatment of Amoebiasis and Other Intestinal Conditions with Entobex]** *Ann. Soc. Belge de Méd. Trop.* 1959, Oct. 31, v. 39, No. 5, 653–62. [14 refs.]

In the region in Yugoslavia (Istria) where the author works, 10 to 15% of the population harbour *Entamoeba histolytica*; a symptomatic and chronic atypical amoebiasis is common among these. 35 patients were treated orally with Entobex. Of 17 with minor symptoms (none of the classical type), and a 4-year-old patient with acute amoebic dysentery, all but 3 of the first 17 were relieved of their symptoms by Entobex treatment. Of 13 patients suffering from chronic colitis [it seems of unproven causation] 11 similarly reacted favourably. 4 additional patients with acute enterocolitis, in whose stools no *E. histolytica* or other pathogen could be found, responded excellently to Entobex treatment.

In spite of failure to find the parasite the author apparently holds that all these patients, with one exception, were suffering from chronic amoebiasis.

A. R. D. Adams

SHAH, J. R., MEHTA, R. H., PATEL, K. H. & PHUTANE, P. N. **Studies on Amebiasis. Part I. Amebiasis Past and Present.** *Indian J. Med. Sci.* 1960, Feb., v. 14, No. 2, 84–91. [17 refs.] **Part II. Further Report on Treatment of Intestinal Amebiasis with Mebinol, a New Dichloracetamide Compound.** *Ibid.*, 92–7. [16 refs.] **Part III. Chemo-Prophylaxis in Amebiasis with Mebinol.** *Ibid.*, 98–110, 2 figs. [27 refs.]

I. In the first of this series of papers, after an introductory historical account of amoebiasis, the authors record some past surveys of the incidence of the condition in India. They add their own findings among 473 bank employees and their families living in flats in Bombay. On clinical grounds 136 of them appeared to be suffering from amoebiasis; 87 of these patients were found to be passing *Entamoeba histolytica* in their stools. While the incidence of bacillary dysentery in India has steadily declined, both absolutely and relatively, that of amoebiasis, the authors consider, has progressively increased to a high level.

II. The 87 stool-positive patients mentioned above were treated, while ambulatory, with 500 mgm. Mebinol thrice daily for 10 days. Stools of 79 of them were later re-examined on 2 or more occasions at intervals; on these findings the authors consider 73% of the patients to have been cured both clinically and parasitologically by the treatment. No side effects attended the use of Mebinol.

III. The high reported incidence of chronic amoebiasis in Bombay and the resultant considerable morbidity show the need for prophylaxis against the

infection. Mebinol appeared suitable for administration to this end. 38 of the patients referred to above as successfully freed of their infections by Mebinol were thereafter given Mebinol twice weekly to " prevent relapses " and reinfections; another 26 similar patients were kept as controls. Those continuing the drug remained stool-negative [as might have been expected] while 9 of the 26 not on it had again been found stool-positive within 3 months [apparently 3 stool examinations]. *A. R. D. Adams*

Diaz Canseco, J. Balantidiasis (una revista y reportaje de 20 casos). [**Balantidiasis. A Review and Account of 20 Cases**] *G.E.N.* Caracas. 1959, July–Dec., v. 14, Nos. 1/2, 111–27, 15 figs. [42 refs.]

Molina Pasquel, C. Tratamiento de la giardiasis con camoquinal. [**Treatment of Giardiasis with Amodiaquine**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Mar., v. 19, No. 1, 97–100. English summary (6 lines).

Because of known disadvantages of mepacrine in the treatment of giardiasis, several workers have used amodiaquine in this disease [this *Bulletin*, 1954, v. 51, 1251; 1957, v. 54, 434; 1958, v. 55, 163].

The present author gave amodiaquine to 48 children and 32 adults in Mexico who were suffering from colitis and who harboured cysts of *Giardia intestinalis* in the stools. Adults were given a single tablet of 0·2 gm. and children received 0·01 gm. per kgm. body weight in divided doses. Stool examinations, 3 in number, were made thereafter every 5 days, where possible, for 3 months. Comparison was made with mepacrine by reference to the clinical histories of patients previously treated with that drug.

Only 65 patients could be followed up and in 43 of them *Giardia* cysts had disappeared from the stools. In 18 patients who had had mepacrine, there had been only one failure and that was in a patient who also harboured *Entamoeba histolytica*.

Evidently amodiaquine was inferior to mepacrine in efficacy, but it was easily administered, better tolerated and free from undesirable side effects [none of these points are detailed in the text]. *H. J. O'D. Burke-Gaffney*

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Shearer, Lois A. & Hoodwin, Jean. **Hansen's Disease—A Modern Approach.** *Internat. J. Leprosy.* Wash. 1959, Oct.–Dec., v. 27, No. 4, 376–81. [Reprinted from *California's Health.* 1958, v. 16, 49–51.]

In California [where, according to an editorial, there are over 250 persons who have had or still have leprosy, and where there are around 15 new cases

a year] the Department of Public Health carried out a spot survey in 1955 among 55 professional and 149 non-professional workers in the department, the object being to find out their knowledge about leprosy. Ignorance of the disease has led to ostracism of the patient, separation from the family which was left without support, and unnecessary restrictions regarding employment. The health department's role in clearing away misconceptions about Hansen's disease cannot be overestimated. In each case the health department staff need to assess the impact of the disease on the patient, his family and the community. *Ernest Muir*

RUSCIANI, A. La malattia di Hansen nella Calabria. **[Leprosy in Calabria]** *Riv. Italiana d'Igiene*. 1959, Sept.–Oct., v. 19, Nos. 9/10, 417–47, 3 figs. & 2 charts. [35 refs.]

The author, a consultant in dermatology and venereology, is medical inspector for the province of Cosenza, Calabria, and his paper deals with the incidence of leprosy in this and in the other 2 Calabrian provinces of Catanzaro and Reggio. He tabulates information for each district of these provinces—height above sea level, population, number of persons known to have the disease on 30 October 1958, presumptive source of their infection, incidence rate and sex distribution. Some of the patients had contracted their disease abroad. Another set of tables shows the distribution by district of open and closed cases and their history of hospitalization, where any. From yet one more set of tabulated details, we learn that there were 69 known cases in the 3 provinces at the end of 1949 and that the number had increased to 122 within the following 9 years—an incidence rise of 53, which suggests a progressive spread. [The first column of figures in the last table of this paper adds up to 69, and not 59 as printed.]

The author discusses the history of the disease and the invasions and other military movements which helped its spread during the first 14 centuries of the Christian era: there followed a phase of spontaneous regression of the disease, which has, however, left endemic foci of varying importance in many countries, including Calabria and other parts of Italy.

This paper includes a lucid general account of the bacteriology, infectivity, epidemiology and aetiology of this disease and of its clinical manifestations in its lepromatous, tuberculoid and indeterminate forms. The author discusses the immunological tests which have been used in diagnosis, the use of up-to-date specific drugs and other measures of prophylaxis and control, including the vaccines which it is hoped will be obtained from the strain of *Mycobacterium marianum* which Sister MARIE SUZANNE, a French nun, has isolated from a missionary who contracted leprosy in Fiji. [Indeed, this part of Rusciani's paper could be incorporated in any textbook to form an excellent chapter on the disease.]

In his view, a patient from whose lesions *Myco. leprae* has been obtained should not be discharged from hospital and allowed to live at large unless subsequent bacteriological examinations have given persistently negative results over a minimum period of 3 years. *J. Cauchi*

SOBUE, A. [**Epidemiological Studies of Leprosy in Aichi Prefecture**] *Lepro.* 1959, Nov., v. 28, No. 6, 340–60, 7 figs. [31 refs.] [In Japanese.]

The English summary appended to the paper is as follows:—

"An epidemiological investigation was carried out on new cases of leprosy between 1906 and 1957 in Aichi Prefecture, mainly in the following leprosaria: Nagashima Aisei-en, Kuryu Rakusen-en, and the Suruga Leprosarium. The findings are as follows.

"1. During the 50 years from 1906 to 1957, 1,546 new cases were found and the incidence rates were between 0·1 and 1·6 per 10,000 population. The average number of new cases in one year is therefore 29·7.

"2. The prevalence rate was 24·7 per 10,000 population at the highest, and 5·3 at the lowest. The number of leprosy patients have come to decrease recently.

"3. New cases were most frequently observed between the ages of 15 and 19, or 19·7% in rate, and 63·1% of the total cases had begun between the ages of 10 and 29.

"4. The disease type L was observed in 59·6%, the type M in 17·0%, and the type N in 23·4%. The type ratio (L/M + N) was 1·47 and has been remarkably improved in the term of Showa (1926–57) in comparison with that in the terms of Meiji (1906–11) and Taisho (1911-1926).

"5. The sex ratio was 259·5 during the above mentioned years, and 460·0 in the term of Taisho at the highest, but recently it decreased to 162·2.

"6. 42·6% of the total cases had one or more other patients in their own families.

"7. In 35·5% of the total cases the symptoms began in Spring; this rate is a little higher than that in other seasons.

"8. 75·6% of the total patients of 1,170 in number, were admitted in leprosaria. In the term of Meiji or Taisho the rate of the patients admitted in leprosaria was lower, but gradually the length of their home residences was shortened. In recent years the patients are admitted in leprosaria immediately after the onset of the disease.

"9. In younger patients the period of their home residences was relatively longer, but a comparatively high rate of them was admitted in leprosaria, while the older patients whose home residences were stablized, were admitted in leprosaria in lower rate.

"10. 7·1% of the total cases were diagnosed to be recovered generally, 45·7% were dead, 24·3% were returned to their own homes. The patients treated in their homes were 1·41 per 10,000 population at the highest, and 0·41% at the lowest which was recorded recently."

SOBUE, A. [**Geographical Studies of Leprosy in Aichi Prefecture**] *Lepro.* 1959, Nov., v. 28, No. 6, 361–77, 1 map. [13 refs.] [In Japanese.]

The English summary appended to the paper is as follows:—

"1,546 leprosy patients observed between 1906 and 1957 were investigated by local distribution. The results are as follows.

"1. In the term of Meiji (1906–11), leprosy patients in urban districts were found in 35% of total patients; in the term of Showa (1926–57) this rate is gradually increased until 45–55%.

"2. The incidence rate was 7·4 per 10,000 population at the highest and 0·2 at the lowest. Evidently different rates were seen by locality.

"3. The prevalence rate during the last 10 years was distributed between 5·6 and 6·8 per 10,000 population.

"4. The type ratio (L/M + N) was observed higher in the mountain districts as 2·25 and in the plain districts where more leprosy patients were found the ratio was 1·89.

"5. The sex ratios (m/f) in urban were between 2·5 and 2·3, and in rural it was 2·7, that is, there were more male patients in rural.

"6. Obvious difference by locality in age of the onset of the disease was observed: no onset in old age was observed in Toyohashi, and Kita-shidara districts, while considerable cases begun in old age were observed in Higashi-kamo, Inazawa, and Nishio districts.

"7. The admission rate was also different by locality.

"In these districts as Seto, Ama, Narumi, Chita, and Nagoya districts, where more patients were noticed to reside, the rate was shown lower.

"8. The home residence of patients was between 8 and 28 years, showing obvious difference by locality. Years from onset to admission in leprosaria were shown between 6 and 12.

"As mentioned above, the conditions of leprosy infection differed by locality, and so, a preventive counter-measure for leprosy must be taken with a consideration of locality."

TARABINI CASTELLANI, J. Bacteriología de la infección hanseniana. [**Bacteriology of Leprosy**] *Rev.* "*Fontilles*". Alicante. 1959, July–Dec., v. 4, No. 8, 685–702.

In addition to a general account of the bacteriology of *Mycobacterium leprae*, this paper has 3 useful appendices listing respectively, in chronological order, the more important attempts to cultivate the organism, experimental infection in animals and inoculation of *Myco. leprae* in man. Unfortunately, exact references are not listed.

MALFATTI, M. Aplicación de la técnica del sombreado al estudio del *Mycobacterium leprae*. [**Application of the Shading Technique to the Study of** *Mycobacterium leprae*] *Semana Méd.* 1959, Dec. 10, v. 115, No. 24, 948–57, 12 figs. [25 refs.] English summary.

This is an investigation into the significance of granulations which appear in lepra bacilli. The author quotes 3 theories: that they are resistant forms, that they are an ultravirus, and that they are degenerate forms of the bacilli. The author himself puts forth the hypothesis that they are a more or less obligatory phase in the life of the bacilli caused by their subjection to various agents, namely the "L" phase which is able to give rise to new bacillary forms or to persist in a filtrable form. The object of the present enquiry was to see what further light the electron microscope would throw on the matter, especially when the shading (*sombreado*) method was used by which a heavy metal volatilized at high vacuum is deposited on the preparation causing a false shadow, and thus facilitating the study.

The appearances obtained are illustrated in several electronmicrographs. Also a scheme is drawn of 4 forms of the bacillus: the clear solid bacillus, the same with 2 bunches of separate vacuoles, where the vacuoles have coalesced, and where the coalesced vacuoles have enlarged to form the granular form. The presence of a halo round each of the isolated bacilli and also round the collections of bacilli gives rise to the idea that this constitutes a diffusible substance, the product of cellular metabolism. It is suggested that it is this substance which makes the inoculation, cultivation and therapy difficult in leprosy.

[See also this *Bulletin*, 1949, v. 46, 476.] *Ernest Muir*

LEW, J. & CHUNG, M. **The Bacteriologic Diagnosis of Early Leprosy by the Trypsin Digestion Method.** *Internat. J. Leprosy*. Wash. 1959, Oct.–Dec., v. 27, No. 4, 360–65. [13 refs.]

A concentration method is described for the detection of *Myco. leprae* in the tissues in doubtful cases of leprosy. The tissue specimen, about 0·5 gm. in weight, freshly obtained or formalinized, is autoclaved and then ground in a mortar in 7–8 cc. of buffer solution containing 0·5% trypsin. After incubation at 39°C. for 3 hours the preparation is centrifuged at 3,000–4,000 r.p.m. for 30 minutes and the supernatant fluid is decanted. Smears of the deposit are examined for acid-fast bacilli.

3 groups of subjects were examined by this method.

(1) 46 slightly suspicious cases were all negative by ordinary methods, but 12 were positive by trypsin digestion.

(2) In 29 patients clinically diagnosed as having early leprosy, and in whom examination by the ordinary smear method had shown only 13 positive for bacilli, the trypsin method showed 28 positive. In 22 tuberculoid or indeterminate patches, where the ordinary method had shown only 7 positive, the trypsin method showed 21 positive.

(3) In 100 closed cases, negative by other methods, 21 were positive by trypsin digestion.

When this method of concentration was compared with other processes, the advantages claimed are as follows. (1) With simple grinding and centrifugation it is impossible to get rid of all the tissue, and organisms are lost during the process. (2) In separating the bacilli by an organic solvent such as chloroform the acid-fastness and chemical structure of the organisms are altered. When this method is applied to rat leprosy bacilli the resulting organisms will not produce the disease when inoculated in rats. (3) With the trypsin method almost all the debris is removed, acid-fastness is not lost, and when rat leprosy bacilli are treated in this way they can still reproduce rat leprosy when inoculated in rats.

Other advantages claimed for the trypsin method are its simplicity, and the fact that it may be used for tissue preserved in formalin and can thus be sent to a distant laboratory for examination. In one examination, where 1 acid-fast organism per 40 or 50 fields was seen by the ordinary method, 5 to 10 organisms per field were found by the trypsin method.

[For earlier studies, see LEW and CARPENTER, this *Bulletin*, 1956, v. 53, 1432.] *Ernest Muir*

CHATTERJEE, S. N. **Mechanism of Blister Formation in Leprosy Patients.** *Internat. J. Leprosy.* Wash. 1959, Oct.–Dec., v. 27, No. 4, 305–20, 14 text figs. + 7 figs. on pl.

Leprosy patients are liable to develop blisters due to burns or scalds. This is generally supposed to be due to want of sensation and consequent lack of warning of the presence of excessive heat. The author however found that this does not entirely explain what occurs, as when a cigarette is held between 2 fingers one of which is anaesthetic and the other not, a blister will appear on the former and not on the latter. Several examples are given and illustrated. In looking for an explanation of this phenomenon the author found that when an anaesthetic skin surface was tested for its temperature immediately before and immediately after the application of heat, and when similarly comparison was made with a normal corresponding skin surface, the temperature of the anaesthetic skin was lower than the normal before heat application and higher than the normal after heat application. This is explained as being indicative of less active blood circulation in the anaesthetic parts owing to less dilatation of the blood vessels. There is thus less heat in the anaesthetic part before heating, and as there is less blood in the part to cause diffusion of heat there is more heat in the part after heat has been applied. The anaesthetic part has to do more adjusting and it has to deal with a greater accumulation of heat; hence the greater liability to blistering.

The author also finds that these experiments confirm his previous finding [this *Bulletin*, 1956, v. 53, 63], that "neutral signs in leprosy are closely associated with capillary contraction, causing diminution of blood supply in the skin of anesthetic parts". *Ernest Muir*

ISHIHARA, S. **A Study of Myositis Interstitialis Leprosa.** *Internat. J. Leprosy.* Wash. 1959, Oct.–Dec., v. 27, No. 4, 341–6, 6 figs.

4 cases are described in which in addition to the ordinary signs of lepromatous leprosy inflammatory infiltration was found in the interstitium between muscular bundles causing atrophy of these bundles. All were advanced, long-standing cases of leprosy, but in one of them giant cells of the Langhans type were found and the lepromin reaction changed from negative to mildly positive. In the other 3 cases there were many globi and massive bacillary infiltration. The author names this rare condition as "myositis interstitialis leprosa". *Ernest Muir*

DERBES, V. J., SAMUELS, M., WILLIAMS, O. P. & WALSH, J. J. **Diffuse Leprosy. Case in a Louisiana Negro.** *Arch. Dermat.* 1960, Feb., v. 81, No. 2, 210–24, 12 figs. [13 refs.]

TARABINI CASTELLANI, J. Lepra visceral. [**Visceral Leprosy**] *Rev. "Fontilles".* Alicante. 1959, July–Dec., v. 4, No. 8, 703–17, 6 figs. on 2 pls.

A general account and review. No references are listed.

ROLLIER, R. **Treatment of Lepromatous Leprosy by a Combination of DDS and Sarsaparilla** (*Smilax ornata*). *Internat. J. Leprosy*. Wash. 1959, Oct.–Dec., v. 27, No. 4, 328–40, 12 figs.

In planning a controlled experiment to test treatment of leprosy with a combination of DDS and red sarsaparilla (*Smilax ornata*) [this *Bulletin*, 1958, v. 55, 514], comparing it with DDS treatment alone, the author chose two groups of patients—111 on the combined treatment and 140 as controls. In the former group 83% became bacteriologically negative within a year, during which time only 52% control patients became negative. The nasal smears of all in the experimental group became negative within 2 years; similar results in the controls required 3 years. It was difficult to judge of an advantage in neuritic disturbances between the 2 groups, but the recovery of perception of heat and pain was more rapid under the combined treatment. With the combined treatment lepra reaction was more frequent, in some 15% as compared with 5% in the controls. The sarsaparilla was administered in tablets of 240 mgm., 4 to 10 of which were given daily for the first week, and 10 tablets daily thereafter. DDS was given in the usual dosage.

The author considers, after mentioning other new forms of treatment such as Ciba 1906 and Etisul, that "treatment of leprosy by a combination of red sarsaparilla and the parent sulfone represents at the present time the best therapy, and that it meets one of the imperatives indicated by various authors, namely, a therapeutic association of different chemical medicaments to avoid drug resistance". *Ernest Muir*

ALONSO, A. M. **The Value of Thiacetazone (TB-1) in Leprosy.** *Internat. J. Leprosy*. Wash. 1959, Oct.–Dec., v. 27, No. 4, 321–7.

The author has tried thiacetazone (TB-1) in 220 leprosy patients, his experience dating from 1951. He finds no advantage in giving more than a daily dosage of 150 mgm. by mouth. Of the 85 lepromatous patients all but one showed constant improvement. Of the 75 tuberculoid type patients all gave entirely satisfactory results. The bacteriological results are similar to those with sulphones, and in some cases are even more favourable. [No details of results are given, and no mention is made of a trial controlled with sulphone therapy.]

TB-1 is considered superior to sulphones in tolerance, in being easier because no blood or urine examination is needed, and in treatment of neural disturbances. In the author's opinion "TB-1 treatment constitutes a first-rate anti-leprosy therapy, and . . . should not be relegated to a place of secondary importance". *Ernest Muir*

ROLLIER, R. & REBOUL, E. Nouveaux essais de traitement de la lèpre lépromateuse par la D-Cyclosérine. [**A Fresh Trial of the Treatment of Lepromatous Leprosy with D-Cycloserine**] *Maroc Méd.* 1960, Jan., v. 39, No. 416, 41–66, 7 figs.

After describing previous trials of D-cycloserine by other workers [this *Bulletin*, 1958, v. 55, 514; 1959, v. 56, 55], the authors give their own

experience in treating 12 lepromatous patients with this drug. Of the 12 patients 1 was subclassed as L-1, 7 as L-2, and 4 as L-3. 2 of them received cycloserine alone; 4 received cycloserine alone to begin with and after 6 months DDS was added, 6 received the combined treatment throughout. Full details of each case are given.

Particulars of improvement under treatment after 18 months are given, those on the combined treatment being divided from the others. The clearing up of bacilli both in the nasal mucosa and in nodules appeared to be more rapid where the combined treatment was used than with cycloserine alone. Apart from 2 patients who had severe reactions due to an overdose, reactions in the other patients were almost entirely afebrile and of short duration. D-cycloserine was on the whole well tolerated, but it is considered necessary to be careful to exclude nervous or mental conditions before starting the treatment.

It is concluded that D-cycloserine should be used only when there is intolerance to DDS, or in association with other drugs so as to avoid drug resistance. More rapid clinical improvement in comparison with DDS and quicker clearing up of nasal infection more than offset the expensiveness of the drug and the greater precautions that have to be taken. *Ernest Muir*

MUKERJEE, N. & KUNDU, S. **Results of Inoculation of White Rats with Human Leprosy Bacilli by the Intraneural Route. Preliminary Report.** *Internat. J. Leprosy*. Wash. 1959, Oct.–Dec., v. 27, No. 4, 355–9.

Because of the prominent neurotropic role of the lepra bacillus the authors tried the intraneural route in attempting inoculation of white rats with *Myco. leprae*. 15 white rats were divided into 3 groups, of which one group was inoculated as a control with normal saline, another group with a saline suspension of leprous tissue rich in bacilli, and a third with a similar suspension with egg albumin added. The inoculations were made into the sciatic nerve in each case.

While the others were negative in their results, in one of the rats in the third group there was a massive infection with acid-fast bacilli when it was killed 3½ months later. Negative results in culture and guineapig inoculation excluded the tubercle bacillus, but ready growth in other rats indicated that this acid-fast bacillus was Stefansky's bacillus and not that of human leprosy.

The authors stress the importance of excluding the chance of infection with Stefansky's bacillus, especially in laboratories where work with both human and rat leprosy is being carried out. *Ernest Muir*

ITO, T. & SONODA, R. **Biochemical Studies on the Murine Leprosy Bacillus. II. Respiration and Respiration Accelerating Substances.** *Biken's J.* Osaka. 1958, Dec., v. 1, No. 2, 157–65. **III. Enzymic Activity.** *Ibid.*, 166–72, 2 figs. [10 refs.]

II. "1) Seventeen substrates, such as glycerin, succinate and vitamin B_{12}, did not accelerate the respiration of murine leprosy bacillus in single addition.

When liver or testis extract heated for 30 minutes at 60°C. was combined with succinate, the respiration is accelerated.

" 2) Blood serum and liver extract in the raw state inhibited the respiration but no effect was apparent when these were heated for 30 minutes at 60°C. Testicular extract alone had an increasing action which was strong with the raw extract and weak with the heated extract. Hepatic, testicular and subcutaneous leproma extract also increased the respiration, this action was enhanced by heating of the extract.

" 3) This respiration increasing substance is resistant to heat, soluble in water, acetone, methanol, ethanol and butanol, insoluble in ether and chloroform, and lost its activity by dialysation."

III. " 1) Enzyme activity of *Mycobacterium leprae murium* was examined in asparagine and aspartic acid, and it was found that asparagine is converted to aspartic acid with freeing of ammonia. It was also shown by studies with the Friedman-Haugen method that transamination takes places between aspartic acid and α-ketoglutaric acid to give oxalacetic acid. So murine leprosy bacillus was found to possess asparaginase and transaminase.

" 2) The presence of catalase and peroxydase of *Mycobacterium leprae murium* was substantiated but nitrate reductase and amylase were not found.

" 3) The attempt was made to adapt *Mycobacterium leprae murium* to several organic acids, but results suggestive of production or existence of adaptive enzymes were not obtained by incubation for 1 hour."

Robson, J. M. & Smith, J. T. **Immunity in *Mycobacterium lepraemurium* Infections.** *Brit. J. Exper. Path.* 1960, Feb., v. 41, No. 1, 81–5, 3 figs. [11 refs.]

Mice were vaccinated intradermally with 3×10^8 *Mycobacterium lepraemurium* or with 10^5 viable units of BCG and challenged intracorneally 12 or 74 days later. Comparison of the macroscopic lesions and the total number of bacilli in the corneas of these mice with those of unvaccinated mice, showed that there was no immunity after 12 days, but there was a definite reduction in the multiplication of the bacilli after 74 days; the challenge inoculum consisted of 10^7 bacilli, and by the 50th day after challenge this had increased only 2- to 3-fold in the vaccinated animals challenged after the 74th day, whereas in the unvaccinated animals it had increased more than 10-fold.

In spite of this reduction in multiplication there was no apparent effect on the macroscopic lesion and the authors suggest two alternative explanations for this discrepancy, *i.e.* the large challenge inoculum in the cornea continues to exert a chemotactic influence on the macrophages which leads to the production of the macroscopic lesion, or the immunity restricts the spread of the bacilli in the cornea, whereas in the non-immune mice these bacilli do spread, and, though not contributing to the visible lesion, they add to the total number of bacilli. *S. R. M. Bushby*

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—TREMATODES (*schistosomes, other flukes*); CESTODES (*Diphyllobothrium, Taenia, Echinococcus, other cestodes;* NEMATODES (*hookworms, Ascaris, filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.*).

CAPRON, A. & BRYGOO, E. R. Sur la constitution des oeufs d'helminthes. I. Présence et formation d'une substance acido-alcoolo-résistante de la coque. **[The Constitution of Helminth Eggs. I. The Presence and Formation of an Acid-Alcohol-Resistant Substance in the Shell]** *Bull. Soc. Path. Exot.* 1959, Sept.–Oct., v. 52, No. 5, 574–7.

In previous papers [BRYGOO *et al.*, this *Bulletin*, 1959, v. 56, 1153; *Bull. Soc. Path. Exot.*, 1959, v. 52, 655] the authors had shown by Ziehl-Neelsen staining that the eggs of certain parasitic helminths contained a substance resistant to decolorization by acid-alcohol.

Among trematodes, this substance occurred in the shell of the eggs of *Schistosoma mansoni*, *Opisthorchis felineus* and other worms, some of which later lose their tendency to stain when they reach the metratermic part of the uterus. By sagittal sections of the worms the authors have shown a Ziehl-Neelsen positive staining in the eggs and in granules of the vitelline secretion; these granules pass by the various lateral and transverse vitellineducts to the central vitelline reservoir at the level of the oötypic region. Apparently the acid-alcohol-resistant substance of the egg shells is formed as granules secreted by the vitelline glands (vitellaria), but other substances are probably also secreted by these glands. The gland of Mehlis does not produce Ziehl-Neelsen-positive substance.

Among the cestodes, the eggs of *Taenia saginata* and of *Diphyllobothrium mansoni* are strongly Ziehl-Neelsen-positive. In *Taenia* the origin of the acid-alcohol resistant substance has not yet been identified; but by histological section the authors have shown that in *D. mansoni* the substance is formed in the vitelline glands.

In nematodes, the eggs of *Enterobius* are Ziehl-Neelsen-positive and there are Ziehl-Neelsen-positive granules widely disseminated through the lumen of the uterus. *F. Hawking*

ALBORNOZ-PLATA, A. Experiencia clinica con el yoduro de dithiazanina, en Bogotá. **[Clinical Experience with Dithiazanine Iodide in Bogota]** *Rev. Facul. de Med.* Bogotá. 1959, Jan.–Feb., v. 27, Nos. 1/2, 77–94, 4 charts.

The author, in Bogota, Colombia, has treated 3 groups of patients with dithiazanine; 20 pregnant women, 22 children and 35 patients with various digestive ailments. All were infected with one or more of the 5 helminths susceptible to this drug. One of the objects was to determine whether there were any contra-indications to its use in children, in pregnant women and in those with gastro-intestinal infections.

The dosage for adults was 200 mgm. thrice daily for 5 days; children were

given 20 to 40 mgm./kgm. body weight. The patients with digestive disturbances (affections of the colon, liver, biliary tract and stomach) were given treatment appropriate to their complaints at the same time. The results are set out in great detail in tables and figures for each group.

Of the whole 77 patients, 35 of 48 with *Ascaris*, 31 of 34 with *Trichuris*, both of 2 with *Strongyloides*, and 6 of 11 with *Necator* were freed of parasites by treatment. Over half of the patients had no side effects and in the others these were mild, consisting generally of nausea and diarrhoea.

Pregnant women tolerated the drug well, irrespective of the stage of pregnancy (but it is admitted that they may not all have completed the course); children also tolerated it, even those aged 2 years; the patients with digestive disturbances suffered no serious inconvenience from the drug.

H. J. O'D. Burke-Gaffney

GUERRERO, L., HOLGUIN, J. & BOTERO, D. **The Use of Dithiazanine as a Mass Treatment for Intestinal Helminthiasis.** *Amer. J. Trop. Med. & Hyg.* 1960, Jan., v. 9, No. 1, 37–8.

Previous reports have indicated that dithiazanine iodide is effective against strongyloidiasis, trichuriasis, ascariasis and enterobiasis, and partially effective against *Necator americanus* [this *Bulletin*, 1958, v. 55, 530]. Conflicting reports have been published as to its action on two tapeworms, *Hymenolepis nana* and *Taenia* species [*ibid.*, 1959, v. 56, 544, 855]. The authors, therefore, in view of this wide range of effective action, decided to use it as a domiciliary form of treatment among members of families selected at random, living in the poorest quarters of the city of Medellín in Colombia.

Each member of the selected families was subjected to stool examination by the Stoll quantitative technique on a single occasion, after which treatment was given at the following dosage:—

under 15 kgm. body weight	200 mgm. daily
16–30 kgm. „ „	400 mgm. „
over 30 kgm. „ „	600 mgm. „

The drug was administered for 8 days. The following results were obtained:—

(a) *Trichuris trichiura*:	215 cases, 66·9% cure rate. 71·9% reduction in egg count in remainder.
(b) *Ascaris lumbricoides*:	207 cases, 81·6% cure rate.
(c) *Strongyloides stercoralis*:	45 cases, 93·3% cure rate. 78·1% reduction in larval count in remainder.
(d) *Necator americanus*:	41 cases, 41·4% cure rate.

The treatment was not free from side effects, though these were transient and never severe; they appeared in 43·5% of those treated. The symptoms, comprising vomiting, nausea, diarrhoea and headache, developed during the first 3 days of treatment and usually subsided spontaneously. They necessitated termination of treatment in only 8 out of 273 patients.

This broad-spectrum anthelmintic is clearly of great practical value in a

community showing a helminthic infection which is intense and multiple as the published table demonstrates.

Persons with 4 helminths	6
„ „ 3 „	35
„ „ 2 „	134
„ „ 1 „	98
	273

J. H. Walters

MEJÍA, R. & BIAGI F., F. El loduro de ditiazanina en algunas helmintiasis. [**Dithiazanine in Helminth Infections**] Reprinted from *Medicina*. Mexico. 1959, Aug. 10, v. 39, No. 825, 346–8.

This extends a previous study [this *Bulletin*, 1959, v. 56, 1039] and records further results with dithiazanine. In 374 treatments of 184 patients, reductions of egg counts by 70% or more were obtained in trichuriasis, ascariasis, and strongyloidiasis in 83·9%, 80·8% and 69·2% of cases respectively. Side effects were usually slight, but vomiting was found in 10·3% of patients.

H. J. O'D Burke-Gaffney

KLOETZEL, K. Resisténcia à dessecação de *Australorbis glabratus*. Comparação entre os caramujos de Olinda (Pernambuco) e um dos focos de Salvador (Bahia). [*A. glabratus* **Resistance to Desiccation. Comparison between Snails of Olinda (Pernambuco) and one of the Foci in Salvador (Bahia)**] *Rev. Inst. Med. Trop. São Paulo*. 1959, Nov.–Dec., v. 1, No. 4, 279–88, 3 figs. [11 refs.] English summary.

A number of reports of differences in susceptibility to desiccation between populations of snail intermediate hosts of *Schistosoma mansoni* [this *Bulletin*, 1956, v. 53, 1355, 1443, 1444] has led the author to attempt to find the reasons for this variation. Experiments were carried out on snails from a locality which dries out each year (Olinda) and from a permanent lake (Dique de Tororo). It was found that the specimens from Olinda were able to survive well if the period of desiccation was started gradually by reduction of the humidity in the surrounding atmosphere; under these conditions the mortality rate was found to be proportional to the loss in weight up to the 74th day after which the death rate increased rapidly, interpreted as a sign of the exhaustion of food reserves. Snails in which the shell aperture was plugged with cotton wool and wax showed a high mortality during the first 4 days but after this period the slope of the mortality curve was identical to that in the controls, the increased early rate probably being due to the impermeability of the shells to carbon dioxide or oxygen. The shells were found to be impermeable to water but partly permeable to water vapour and it was found that snails could survive up to 3–4 days without oxygen. The snails from Dique de Tororo showed very little resistance to desiccation but no other apparent differences between the two populations could be detected.

C. A. Wright

SLEEMAN, H. K. **Isolation and Study of a Specific Complement Fixing Antigen from Adult** *Schistosoma mansoni*. *Amer. J. Trop. Med. & Hyg.* 1960, Jan., v. 9, No. 1, 11–17. [25 refs.]

An antigen was isolated from adults of *Schistosoma mansoni* by extraction with sodium deoxycholate solution followed by further chemical purification [for details see original]. Two preparations of this antigen were studied, *viz.* a "pure" preparation and an "ether-saline" preparation which was more sensitive but less specific. When 126 sera from *S. mansoni* infections of man were tested by complement fixation, 113 reacted with the "pure" antigen and 118 with the ether soluble preparation. Reactions were also given to both by sera from *S. japonicum* and *S. haematobium* infections. When 35 syphilitic sera were tested, reactions were also given in 11 cases with the "ether-saline" antigen and in none with the "pure" antigen. No definite reactions were given by sera from infections with *Trichinella*, *Paragonimus* or *Fasciola*, or with sera from healthy people. The "pure" antigen seemed to consist of a single fraction when studied by electrophoresis. It appeared to be a lipo-protein containing 2·5 parts of protein to one part of lipid. Carbohydrate was not present.

[This paper contains much technical information about the extraction of antigens, which should be consulted in the original by those interested.]

[See also this *Bulletin*, 1955, v. 52, 173; 1956, v. 53, 1440.] *F. Hawking*

LEE, Chung-Ling & LEWERT, R. M. **The Distribution of Various Reactants in Human Anti-***Schistosoma mansoni* **Serums fractionated by Starch Electrophoresis.** *J. Infect. Dis.* 1960, Jan.–Feb., v. 106, No. 1, 69–76, 2 figs. [12 refs.]

6 sera from patients with *Schistosoma mansoni* were separated by starch electrophoresis. The peak of the substance inhibiting cercarial enzyme occurred in the alpha globulin with slight activity extending to the beta globulin, the complement-fixing antibodies for cercariae and for adult worms being found in approximately the same place. Circumoval precipitins occurred mostly in gamma globulin with some in beta globulin. Miracidial agglutinins occurred mostly in the beta and gamma globulins but the alpha globulin fraction also contained substances which immobilized miracidia without producing agglutination. Antibodies which immobilized cercariae were found in the albumin region; and antibodies which immobilized cercariae and produced precipitates round them occurred in the gamma 1 and 2 fractions.

The antibodies which occur in the albumin and alpha-globulin fractions are also found (in a weaker concentration) in normal sera; they may be non-specific factors of normal occurrence which are increased in schistosomiasis. The formation of precipitates around miracidia, the agglutination of miracidia and the circumoval precipitins are considered all to be due to the same antibody.

F. Hawking

CANCIO, Marta, DE SALA, Amina R. & RODRIGUEZ-MOLINA, R. **Electrophoretic Isolation of Circumoval Precipitins in the Serum of Individuals infected with** *Schistosoma mansoni*. *Exper. Parasit.* New York. 1959, Dec., v. 8, No. 6, 549–56, 3 figs.

The serum proteins of patients infected with *Schistosoma mansoni* were separated by continuous-flow paper electrophoresis into 6 fractions. After suitable dialysis against normal human serum to restore the correct osmotic pressure and salts, the fractions were tested for the circumoval precipitin reaction around eggs of *S. mansoni*. The active antibodies were present only in the gamma-1-globulin fraction. If the ion content of the preparation was disturbed by dialysis against unsuitable fluids, no reaction occurred.

According to Evans and Stirewalt [this *Bulletin*, 1959, v. 56, 848] the antibodies responsible for the CHR (pericercarial envelope-forming reaction) and for cercarial agglutination are localized in a fast-moving portion of the gamma-1 globulin. *F. Hawking*

Fiorillo, A. M. Estudo eletroforético das proteinas séricas na esquistossomíase mansoni, forma hépatoesplênica. [**Electrophoretic Study of the Serum Proteins in the Hepatosplenic Form of** *Schistosoma mansoni* **Infection**] [Thesis.] 31 pp., illustrated. [35 refs.] English summary. 1957. Ribeirão Preto: Departamento de Clínica Médica, Faculdade de Medicina, Universidade de São Paulo, Brazil.

A full technical study, the subject of a thesis for a doctorate. [See also this *Bulletin*, 1955, v. 52, 994.]

Mousa, A. H. & El-Garem, A. **The Haemodynamic Study of Egyptian Hepato-Splenic Bilharziasis.** *J. Egyptian Med. Ass.* 1959, v. 42, No. 8, 444–55, 7 figs. on 3 pls. [25 refs.]

Egyptian splenomegaly is a consequence of several aetiological factors; of these *Schistosoma mansoni* infection is but one. This infection, as a sole cause, is responsible for only one-third of the cases; in another third it is found with such conditions as viral hepatitis and extra-hepatic vascular lesions, or nutritional deficiencies. In the remaining third of cases of the syndrome schistosomiasis plays no part in its causation.

46 patients suffering from schistosomal infection with hepato-splenic involvement were subjected to full haemodynamic studies. Portal and splenic venous pressures were measured; the portal circulation time was estimated; the portal circulation and collaterals were visualized radiographically; and other examinations, such as liver biopsy and liver function tests, were undertaken. By these means it was found possible to differentiate the periportal fibrosis due to the worm infection from portal cirrhosis of other causation by the marked discrepancy between intrasplenic and occluded hepatic vein pressures characteristic of the schistosomal liver damage. The intrasplenic pressure in this condition is much raised (up to 400 mm. saline); this indicates that the portal hypertension is a presinusoidal one. In Laennec's cirrhosis the portal hypertension is at the level of the sinusoids, and the occluded hepatic vein pressure corresponds closely to the intra-splenic pressure.

[This paper should be consulted in the original by those interested in this aspect of the subject and its technicalities.] *A. R. D. Adams*

MENDES, T. F. **Diagnosis of Hepatosplenic Schistosomiasis.** Reprinted from *Proc. World Congress Gastroenterol.*, Wash. 1958, 217–25, 5 figs.

Schistosoma mansoni infection is extensively endemic in suburban as well as in rural areas of Brazil. Hepato-splenic complications are not uncommon and often are fatal. 50 patients (35 of them male, and all aged between 16 and 63 years) suffering from this condition were studied at a hospital in Rio de Janeiro. About half of the patients had lived on a diet deficient in protein and vitamins; a third of them were chronic alcoholics; many of them had other helminth infections; and syphilis, malaria and other diseases had been, or were, evident in a substantial proportion of them. Abdominal pain, diarrhoea, emaciation, nausea and vomiting, haemorrhagic troubles such as melaena, haematemesis, and epistaxis, were common complaints. Splenic enlargement was present in all cases; the liver was enlarged in most. Details of these enlargements and other data are given in tables. Ascites was common; it was evident in more than half those with considerable splenic enlargement. X-ray studies, including splenoportography, and oesophagoscopy established the presence of oesophageal varices in about three-quarters of these patients; the portal block was intrahepatic in all of them and there was much evidence of retrograde flow to collaterals of the portal vein. Average portal venous pressures, where determined, invariably were high (200 to 350 mm. water). Liver function tests gave inconsistent results. There are some photomicrographs of wedge biopsy specimens of liver removed during biopsy. On 7 patients splenectomy was done; on 12 splenorenal shunts (2 of these patients then had portocaval shunts after haemorrhage); and on 8, portocaval shunts were done. 8 patients have since died, 4 after haemorrhage and 4 after hepatic coma. *A. R. D. Adams*

IBRAHIM, M. & GIRGIS, B. **Bilharzial Cor Pulmonale. A Clinico-Pathological Report of 50 Cases.** *J. Trop. Med. & Hyg.* 1960, Mar., v. 63, No. 3, 55–8, 4 figs. [18 refs.]

After reviewing the literature on the subject the authors record very briefly the main symptoms and signs of this condition in their patients in Egypt, 3 of whom came to autopsy. Cardiac catheterizations of 3 patients gave the figures 60, 85 and 75 respectively for the pulmonary artery pressures; the cardiac output and arterial oxygen saturations in these 3 were normal. Early schistosomal cor pulmonale is arrested by effective schistosomicidal treatment; this is hazardous in more advanced stages with right ventricular decompensation.

A. R. D. Adams

CHOU, Hsüeh-Chang & HUANGFU, Ming. **Pumpkin Seed (*Cucurbita moschata*) in the Treatment of Acute Schistosomiasis.** *Chinese Med. J.* Peking. 1960, Feb., v. 80, No. 2, 115–20.

While screening some 500 traditional Chinese remedies for their therapeutic action on *Schistosoma japonicum* infection the seeds of the pumpkin *Cucurbita*

moschata were selected as worthy of trial in man. The raw seeds had been given to mice experimentally infected with this parasite in 3 gm. doses daily for 28 days from the day of infection; in these animals the worm load was found to be reduced to a quarter of that found in controls; two-thirds of the animals were free from the parasites, and one-quarter of them harboured only male worms.

89 patients with naturally acquired Far Eastern schistosomiasis (72 male and 17 female, more than half of them under 14 years of age) were given orally a powder prepared from shelled pulverized seeds, from which 20% of the 40% oil content disappeared during the grinding. For adults the dose was 80 gm. thrice daily for one month; for children weighing less than 20 kgm. one-half, and for those between 20 and 25 kgm. two-thirds of that dose. Indigestion and diarrhoea, controllable by palliative treatment, were the only side effects.

The immediate effects on the disease were found to be striking; fever in most patients declined very rapidly, and in the worst cases within 2 weeks; liver and spleen enlargements diminished markedly in most of them; and body weights usually increased. Abnormalities in liver function tests and in electrocardiographic recordings which were evident initially in patients so examined lessened or disappeared during the treatment. Miracidial hatching tests repeated for 1 to 3 months after treatment on stools from 31 patients showed 7 (22·6%) of these to have become negative.

Patients with severe schistosomal liver and heart damage, together with emaciation and nutritional oedema, support antimony treatment very badly; it may precipitate a fatality. Pumpkin seed treatment by contrast is efficacious and safe, though the presumptive parasite sterilization rate following it (22·6%) was not so good as that following antimony treatment (34 to 55%). A combination of these 2 treatments for 4 patients, with a reduced dosage of potassium antimony tartrate, yielded the best of the results expected from both treatments; all patients recovered rapidly and all 4 gave negative hatching tests during the subsequent 6 months. *A. R. D. Adams*

CHEN, En-Hung, SHEN, Mai-Ling, LIANG, Yu-I & TING, Kuang-Sheng. [**Studies on Antischistosomal Drugs. XIX. Carbohydrate Metabolism of** *Schistosoma japonicum* **and the Effect of Several Drugs**] Reprinted from *Acta Biochimica Sinica*. 1959, July, v. 2, No. 1, 42–8. [22 refs.] [In Chinese.] English summary.

SHEN, Mai-Ling; LIANG, Yu-I; TING, Kuang-Sheng; CHEN, En-Hung; TSOU, Chen-Lu. [**Studies on Antischistosomal Drugs. XXIV. Effects of Several Drugs** *in vitro* **on the Cholinesterase Activity and the Motility of** *Schistosoma japonicum*] [SHEN, LIANG & TING]. Reprinted from *Acta Biochimica Sinica*. 1959, Dec., v. 2, No. 2, 79–85, 1 fig. [23 refs.] [In Chinese.] English summary. [**XXV. Relationship between Inhibition of Glycolysis in** *Schistosoma japonicum* **by Tartar Emetic and its Therapeutic Activity**] [SHEN, TING, CHEN & TSOU]. *Ibid.*, 86–95. [21 refs.] [In Chinese.] English summary.

WALTON, B. C. & CHYU, I. **Clonorchiasis and Paragonimiasis in the Republic of Korea. Report on a Prevalence Survey using Intradermal Tests.** *Bull. World Health Organization.* Geneva. 1959, v. 21, No. 6, 721–6, 3 figs.

Previous information on the prevalence of infections with *Clonorchis sinensis* and *Paragonimus westermani* has been based on examinations of stools and sputum, and the recovery of eggs of *P. westermani* is difficult and often impossible by these techniques which are expensive and take much time. Recently SADUN *et al.* [this *Bulletin*, 1959, v. 56, 1254; *Milit. Med.*, 1959, v. 124, 187] described a reliable intradermal test, which costs little, is simple and is easily applied. They [this *Bulletin*, 1959, v. 56, 853] used it for a preliminary survey in Korea and in the present paper they record results of tests of a large population sample with it.

The antigens were acid-soluble protein fractions of whole worm preparations obtained by Melcher fractionation and were standardized to contain about 10 mgm. protein per 100 ml. The methods used were those of SADUN *et al.* [*ibid.*, 1959, v. 56, 1254]. A total of 7,085 persons were tested in localities shown on the maps illustrated and, in addition, 2,686 persons previously tested were included. All were given, on the volar surface of the same arm *P. westermani, C. sinensis* antigen and a buffered thiomersal control sufficient to produce a bleb with an area of about 20 mm.^{2} Wheals were estimated, by a method described, after 15 minutes. The fact that limited cross reactions between clonorchiasis and paragonimiasis are recognized was taken into account. Tables and maps of the prevalence of the two species record the results obtained.

Clonorchiasis. Positive reactions to this antigen were obtained in all the provinces investigated, the highest percentages (53% of all males, 14% of all females tested) being obtained in Kyong Sang Puk To and the lowest (3% of males and 1% of females tested) in the island of Cheju Do. In a highly endemic area positive reactions were found in children as young as 2 years, prior stool examinations having revealed infections in children as young as 18 months. Excepting the atypical 0–5 age-group, the rate of infection of males was considered higher than that of females. In general the positive percentages increased with age up to 41–50 years.

Paragonimiasis. Positive reactions were found in all provinces investigated. The most highly endemic was the island of Cheju Do, with an overall rate of 47% of positives for all persons tested; the lowest was Kyonggi Do, with 3%. The rate for males was higher than that for females in all the provinces and age-groups.

The widespread infection with both species is in contrast to the general view that these infections occur primarily in endemic areas. In clonorchiasis, areas of low endemicity are so widely scattered that it could be considered holoendemic for South Korea. Most infections occurring in many areas are probably not autochthonous. In Chonan few middle and high school students were infected, but the percentage infection in the adults was five times as high and almost all these adults had travelled to, or had lived in, endemic areas and had eaten raw fish there. Migrations of people during the Korean war also influenced the spread. The total number of cases of clonorchiasis in Korea, based on the overall prevalence rate, is estimated at 4½ millions. The higher percentage in males is

probably related to social customs, such as eating raw fish with rice wine, in which the women do not take part.

In paragonimiasis, movements of the people also played a part in the spread of the infection. It was estimated that the total number of infections with *P. westermani* in Korea is between 1 and 1½ millions, with 125,000 in Cheju Do alone. This infection infects fewer people, but is a greater problem because of its more serious pathological effects. Many people say they do not eat raw crab and in many places raw crab is heavily salted for a minimum of 3 days and it is not likely that the metacercariae could withstand this. Possibly other methods of infection must be considered, one being the traditional home treatment of measles by administration of the liquor of crushed raw crayfish. In a recent epidemic of measles there LEE (personal communication) estimated that more than 80% of children with measles were thus treated. *G. Lapage*

MIKI, T. **[Studies on Precipitin and Rapid Flocculation Tests for Clonorchiasis]** *Shikoku Acta Med.* 1959, Nov., v. 15, No. 5, 133–66, 51 figs. [61 refs.] [In Japanese.] English summary.

The author, from the School of Medicine, Tokushima University, Japan, prepared an antigen from whole adult *Clonorchis sinensis* recovered from rabbits and dogs infected with metacercariae 4 weeks previously. The worms, in saline, were dried, pulverized, extracted in saline at a concentration of 1 in 100 and left in the refrigerator for 48 hours. The material was then centrifuged at 4,000 r.p.m. for 30 minutes. 5 antigens were used in the precipitin test, namely (1) the supernatant from the whole worm extract in saline, (2) protein and (3) polysaccharide fractions from worm extract, (4) "foster fluid" from the adult worm and (5) antigen from worm extract heated to 100°C. for 60 minutes.

The test was performed by overlaying 0·1 ml. of serum from infected rabbits with 0·1 ml. of antigen. Sera were diluted with 1% gum arabic in saline. The characteristic white ring formation was looked for after 2 hours at room temperature.

A positive precipitin reaction was obtained with all 5 antigens, but the whole worm body antigen gave the best results. In infected rabbits treated with antimony the titre decreased. In sensitized rabbits a higher titre was obtained in animals that had been sensitized by the intravenous route than was found in those sensitized subcutaneously.

For the flocculation test a cholesterol-lecithin antigen was prepared with the whole worm body extract. 1 drop of antigen was added to 0·1 ml. of serum dilutions in hollow-ground slides. After rotation at 120 r.p.m. for 15 minutes, clumping was looked for at a magnification of × 20 or × 50.

Positive results were obtained with the sera of infected rabbits at a titre of 1 in 4 or more. The reaction diminished or disappeared after treatment. Positive reactions were also obtained in rabbits sensitized subcutaneously but not in those sensitized intravenously.

The author states that these tests showed "excellent and specific reaction" and that to some extent a criterion for the cure of clonorchiasis may be established with them.

[The abstract has been prepared from the author's summary in English. No figures are given in that summary but many tables and histograms are shown in the Japanese text: the abstracter has been unable to interpret them in the absence of captions in English.] *H. J. O'D Burke-Gaffney*

HERNANDEZ-CHIÑAS, J. C., TAY, J. & BIAGI F., F. Epidemia familiar de fasciolosis en la Ciudad de México. [**Family Outbreak of** *Fasciola* **Infection in Mexico City**] Reprinted from *Medicina.* Mexico. 1959, Dec. 10, v. 39, No. 833, 529–31.

5 members were affected, apparently from eating watercress.

LUCKER, J. T. & DOUVRES, F. W. **Survival of** *Taenia saginata* **Eggs on Stored Hay.** *Proc. Helminthological Soc. of Washington.* 1960, Jan., v. 27, No. 1, 110–11.

The authors tried to find out how long hay known to have been contaminated with eggs of *Taenia saginata* needs be stored to destroy the eggs in it. Chains of proglottids of the tapeworm and also free eggs were divided into aliquots, a control aliquot in saline solution being immediately put into a refrigerator. On the same day each of the other aliquots was put in alfalfa hay in a separate glass tube about 6 inches long and 1¼ inches in diameter. In the middle 2 inches of the tube the authors placed crumbled alfalfa leaves, an aliquot of the experimental material and another layer of leaves, while, from here to each end, the tube was lightly plugged with a layer of stemmy hay and a leafy layer, each end of each tube being covered with two-ply cheesecloth. Each aliquot consisted of (1) six proglottids which appeared to be gravid; (2) six doubtfully gravil proglottids; (3) about 180,000 free, brown-shelled eggs in about 5 ml. of saline solution. The tubes were kept horizontal at room temperature till the next day. The control aliquot was then removed from the refrigerator and transferred to a gelatin capsule which was administered to a calf, and the tubes were inserted horizontally into a bale of alfalfa hay in a hay loft along the axis of the bale.

When a tube was removed from the bale, its contents and a small volume of water in which the emptied tube had been washed were mixed with calf meal and this meal was offered to hungry calves, which quickly and completely ate it in addition to calf meal moistened with washings from a tray in which the mixture had been kept. The calves used were reared at the Beltsville Agricultural Research Centre and extraneous infection with *Cysticercus bovis* has not been found in any of a large number of cattle kept on the same premises under the same conditions.

Calf 1, which received the control aliquot and was killed 63 days later, was heavily infected with *C. bovis*. The following numbers of cysts were found by fine slicing with a knife in the weights of the various organs named: heart 251 in 110 gm.; masseter, 90 in 85 gm.; diaphragm 20 in 45 gm.; hind legs 28 in 270 gm.; shoulders 7 in 75 gm.; neck 18 in 110 gm.; intercostal 2 in 45 gm. In the tongue, which was completely examined, 5 cysts were found

and 12 were found in the buccal tissues near by and 7 in the oesophageal muscles.

In calf 2, which received an aliquot stored in the hay for 22 days at an outdoor temperature of 34–87°F., and was killed 77 days after taking the aliquot, only 1 cyst was found. None were found in calf 3, which received an aliquot stored in the hay for 71 days (outdoor temperature 11–87°F.) and was killed 70 days after taking the aliquot. The heart, diaphragm, masseters, tongue and oesophageal muscles of calves 2 and 3 were completely examined or nearly so and larger samples were taken and more incisions made than in calf 1, and in each case the examination was much more extensive than the Federal meat inspection regulations prescribe.

The authors conclude that a small percentage of *T. saginata* eggs kept on hay under the conditions described remained viable for about 3 weeks, but that none remained viable for 10 weeks. Their loss of viability was probably due to desiccation. SILVERMAN (*Trans. Roy. Soc. Trop. Med. & Hyg.*, 1956, v. 50, 8) found that eggs of *T. saginata* did not live longer than 14 days without surface moisture, irrespective of relative humidity.

Calf 1 contained many small or very small "cysts". Each of the larger ones contained a larva and in those examined on the day this calf was killed the larva was alive. Histological examination of the small "cysts" revealed no cestode tissue and many of them had been replaced by lymphoid cells, a few neutrophils and occasional eosinophils. These small foci resembled tissue reactions that had developed around recognizable *C. bovis* and the authors think it reasonable to assume that they were provoked by larvae of *T. saginata* that had died early in their development. *G. Lapage*

BIAGI F., F., GÓMEZ OROZCO, L. & ROBLEDO, Efigenia. Efectividad del Diclorofen contra *Hymenolepis nana*. [**Efficacy of Dichlorophen against** *Hymenolepis nana*] Reprinted from *Bol. Méd. Hosp. Infantil.* Mexico. 1959, v. 16, No. 2, 113–16. English summary (4 lines).

The authors gave a single dose of dichlorophen at a dosage of 500 mgm. per 8 kgm. body weight to 68 patients. 64 had *Hymenolepis nana* infection and 4 had *Taenia saginata*. In all the last named the parasites were eliminated. In the *H. nana* infections egg counts were reduced by 70% or more in 78·6% of cases. *H. J. O'D. Burke-Gaffney*

SCHILLER, E. L. **Echinococcosis in North America.** *Ann. Intern. Med.* 1960, Feb., v. 52, No. 2, 464–76. [63 refs.]

LUBINSKY, G. **The Maintenance of** *Echinococcus multilocularis sibiricensis* **without the Definitive Host.** *Canadian J. Zool.* 1960, Feb., v. 38, No. 1, 149–51.

"Hydatid cysts of *Echinococcus multilocularis sibiricensis* have been transplanted serially from cotton rat to cotton rat. These cysts have also proved transferable to white mice and gerbils. Hydatid cysts of the fourth transfer produced scoleces and were infective to dogs."

FISCHMAN, A. **Flocculation Tests in Hydatid Disease.** *J. Clin. Path.* 1960, Jan., v. 13, No. 1, 72–5. [14 refs.]

This paper describes the use of a hydatid-sensitized latex suspension as a suitable antigen for a diagnostic flocculation test for hydatid disease. Polystyrene latex suspensions of particle size 0·81μ diameter, sensitized with a pooled hydatid fluid in accordance with the detailed technique described, are used with doubling dilutions of the sera under test. The mixture of antigen and serum is incubated for 90 minutes at 37°C. and then kept overnight at + 4°C., after which the readings are taken. A positive result is recorded if there is a heavy deposit. A modified technique with bentonite particles has also been used [this *Bulletin*, 1958, v. 55, 187]. When the results in comparative trials with the hydatid complement-fixation test were examined it was found that there was about 90% agreement in cases of hydatid disease and about 98% with the CFT in mixed positive and negative sera. The tests are recommended by the author as they are considered easier to perform, but insufficient evidence is available to show that they are more sensitive or more reliable tests than the standardized complement-fixation test. *H. J. Bensted*

CASAS, J. A. F. R. & BRAKIN, N. Parasitosis humana por *Dipylidium caninum* (Linneo 1758). (3er. caso Argentino.) [**Human Infection with** *Dipylidium caninum*] *Rev. Facul. Ciencias Med.* Cordoba. 1959, July–Sept., v. 17, No. 3, 217–22, 6 figs. [13 refs.] English summary.

A case in a child of 23 months in Argentina.

STRANSKY, E. & LORENZO, A. S. **On Raillietiniasis in the Philippines.** [Miscellanea.] *Acta Tropica.* Basle. 1960, v. 17, No. 1, 80–83. [18 refs.]

Raillietina garrisoni was found in the stools of 2 infants, aged 2 years and 8 months respectively.

MOLINA PASQUEL, C. & DÍAZ MUÑOZ, A. Efectividad del tetracloroetileno emulsionado en el tratamiento de la uncinariasis. [**Efficacy of Emulsified Tetrachlorethylene in the Treatment of Hookworm Disease**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Mar., v. 19, No. 1, 11–14. English summary.

PICHARDO SARDÁ and AUDÉ RODRÍGUEZ (*Bol. de Salud Pub. República Dominicana*, 1957, v. 12, 39) mixed tetrachlorethylene with Tween 80 as a means of improving the efficacy of the drug in the treatment of hookworm disease, and claimed success in 4 patients thus treated.

The present authors, in Mexico, have tried this method in 36 patients with hookworms, mostly *Necator americanus*. They gave tetrachlorethylene in a dosage of 0·12 ml. per kgm. body weight mixed with 125 ml. of water to which had been added 2 drops of Tween 80. The mixture was well shaken and given on an empty stomach. Stoll counts were made before and 10 days

after this treatment and when these were positive the treatment was repeated at intervals of 10 days.

No undesirable side effects were observed. Eggs disappeared from the stools of 25 patients after a single treatment. In 3 of the remainder, egg counts were reduced by 50 to 72%. In 6, treatment was given twice and eggs disappeared in 2: in the remaining 4 the egg counts were reduced by 98·3% in one case and by 78·5% in another. 2 patients required 3 courses of treatment and one required 4.

The authors note that in previous studies in Mexico, the use of tetrachlorethylene in gelatin capsules without a purgative and given in a single dose brought about disappearance of the eggs from the stools in only 10 to 33% of cases. The present 25 out of 36 is claimed as 69·4%.

The authors consider that the efficacy of tetrachlorethylene was greatly increased by the addition of an emulsifying agent. *H. J. O'D. Burke-Gaffney*

González Barranco, Dolores & Mazzotti, L. Tolerancia a la administración del tetracloretileno emulsionado en niños escolares. [**Tolerance of Emulsified Tetrachlorethylene in Schoolchildren**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Mar., v. 19, No. 1, 101–4. English summary (5 lines).

With the object of assessing the tolerance in children of tetrachlorethylene without a purgative [this *Bulletin*, 1955, v. 52, 60] and as a preliminary to field trials with emulsified tetrachlorethylene in the treatment of hookworm disease, the authors studied this treatment in 45 subjects in Puebla, Mexico, with proved *Enterobius vermicularis* infections. The subjects were all girls aged 1 to 19 years, mostly between 5 and 14.

Laboratory experiments showed that "Eumulgin 05", a non-ionic emulsifying agent, supplied by Tamm & Co., Mexico, gave a better emulsion with tetrachlorethylene and more prolonged stability than did Tween 80.

The formula used consisted of 100 ml. of tetrachlorethylene, 1 ml. of Eumulgin 05 and 900 ml. of water. Each person was given 1 ml. per kgm. body weight (0·1 ml. of tetrachlorethylene) on an empty stomach together with a glass of water.

Two days after the first treatment, tests with Graham's tape showed that 23 subjects were negative, but a week later 8 of these had become positive again. The 45 subjects were all given a second treatment a fortnight later: after 8 days, 21 were found to be negative.

9 out of 10 subjects had mild dizziness [*mareos*] and somnolence after treatment, 5 had mild nausea and one vomited. In general, however, the authors consider that the drug was well tolerated by children in the doses used.

The results agree with those of Wright *et al.* [*ibid.*, 1938, v. 35, 381] who obtained only 47% of cures with tetrachlorethylene followed by a purgative. Nevertheless the authors consider that their main question was answered: the drug can be given readily to children and this form of treatment is cheaper than when capsules are used. [Presumably the reason why patients with enterobiasis were tested was because this infection is so common in children.]

H. J. O'D. Burke-Gaffney

HAYASHI, E., TAKAMURA, S., SUGIYAMA, K. & SUGIYAMA, T. **[Fundamental Studies of Anthelmintics. (8) Studies on the Anthelmintic Effect of 4-Iodothymol against Hookworm]** *Japanese J. Parasit.* 1959, Dec., v. 8, No. 6, 909–12. [12 refs.] [In Japanese.] English summary.

The English summary of this Japanese paper, from the Shizuoka College of Pharmacy, gives a brief account of the treatment of 77 schoolchildren suffering from hookworm infection with a new anthelmintic, 4-iodothymol (4-iodo-3-methyl-1-hydroxy-6-isopropyl benzene).

The total amount of the drug given was 3–12 gm. (about 80–120 mgm. body weight) and was divided into 2 to 4 parts, "each one of which was administered during two to four days". Stools were examined by direct smear, flotation and cultivation. It was found that hookworms were eliminated completely in 59% of patients. In the dosage used, the drug was more effective in children under 12 years of age (77·8%) than in older children (54·2%); in males (65·6%) than in females (55·6%); and in light infections (68·7%) than in heavy infections (28·6%).

However, egg counts were decreased significantly in heavy infections and the dosage was therefore increased in these cases to 150–320 mgm./kgm. in 3 or 4 parts given during 3 or 4 days. This resulted in complete elimination of hookworm in all patients. *H. J. O'D. Burke-Gaffney*

SOH, C. T. **The Effects of Natural Food-Preservative Substances on the Development and Survival of Intestinal Helminth Eggs and Larvae. I. Action on *Ascaris lumbricoides* Eggs.** *Amer. J. Trop. Med. & Hyg.* 1960, Jan., v. 9, No. 1, 1–7. [16 refs.] **II. Action on *Ancylostoma duodenale* Larvae.** *Ibid.*, 8–10. [10 refs.]

I. A study was made of the power of food preservatives (as used in Korea) to kill the eggs or the infective larvae of *Ascaris lumbricoides*, so as to render the preserved foods safe for human consumption. Tests were made at 22°–28°C. Salt, sugar, vinegar, and ethyl alcohol, in concentrations used in foods, had no effect on either the infective or the developmental stages. After 40 days in half-strength bean sauce there was poor survival of larvae and no development of eggs, but the eggs remained alive. In 1% garlic, 5% mustard and 20% onion infusates, eggs and infective larvae were killed in 20 and 40 days respectively. Infusions of 20% red pepper did not kill infective larvae or eggs but they barred their development. 5% infusions of clove, all spice, cinnamon, or 10% of ginger killed about half the larvae and killed many but not all the eggs. If several preservatives were combined in one pickle, the effects were not additive but sometimes there was interference.

II. Similar tests were made on the eggs and larvae of *Ancylostoma duodenale* at 24–28°C. All the common preservatives (such as those mentioned in the first paper) prevented the development of the eggs and rhabditoid larvae, so that these would not be infective when the foods were eaten after 2–3 days' pickling in most cases. Infective larvae were more resistant than the developmental larvae, and in half-strength bean sauce and 1% infusions of the spices they survived for 2 days or longer. Garlic and mustard were highly toxic to

infective larvae; but their toxicity was diminished by boiling for 30 minutes. In general, if mustard or garlic are used in pickling, and acetic acid (vinegar) is omitted, foods preserved in pickling mixtures for periods of several weeks will contain no infective larvae of *A. duodenale* and very few, if any, of *Ascaris*. *F. Hawking*

Biocca, E. Infestazione umana prenatale da *Spirocerca lupi* (Rud., 1809). [**Prenatal Human Infection with** *Spirocerca lupi*] *Parassitologia*. Rome. 1959, Oct., v. 1, No. 2, 137–42, 3 figs.

The English summary appended to the paper is as follows:—

"Nematodes found in the intestine of a premature new-born child with meconium fetal peritonitis (case studied in Naples by Moretti and Pezzani) were identified as male and female adults of *Spirocerca lupi*. On the basis of such findings, it is therefore possible to state:

1) *Homo sapiens* may act in the fetal and new born stage as final host of *Spirocerca lupi*.

2) The very serious lesions caused by *S. lupi* were resembling the picture of Spirocercosis of canines with localisation of adult parasites in the walls and lumen of the host's intestine."

De Rook, H. **Filariasis in the Village of Inanwatan (South Coast of the Vogelkop, Netherlands New Guinea).** *Trop. & Geograph. Med.* Amsterdam. 1959, Dec., v. 11, No. 4, 313–31, 2 maps, 5 figs. & 1 graph. [25 refs.]

A filariasis survey of 5 weeks' duration was carried out in the village of Inanwatan, Netherlands New Guinea. An earlier survey had established that *Wuchereria bancrofti* infections were prevalent in this area and that *Anopheles farauti* was a probable vector [this *Bulletin*, 1933, v. 30, 697].

The entire population of 1,125 was examined for microfilariae, specimens of the peripheral blood being taken at night between 8 and 10 p.m. The microfilaria rate was 20·9% and the filarial disease rate 8·0%. The average number of microfilariae per 15 cmm. of blood in those infected was 22·4.

Culex annulirostris, *A. farauti* and *C. fatigans* were incriminated as vectors. *A. farauti* showed the highest natural infection rate, but at the time of the survey its numerical prevalence was low. *C. annulirostris*, which was present in large numbers, also showed a high infection rate. The relative importance of these 2 vectors is probably dependent on their numerical prevalence, which varies from season to season. *C. fatigans* is regarded as a vector of minor importance.

Antilarval measures against the 2 principal vectors are considered impracticable. Transmission by *A. farauti* might be interrupted by the use of residual insecticides and it is thought that a field trial might yield information as to the susceptibility of *C. annulirostris* to this means of control. Local circumstances appear favourable for mass treatment of the inhabitants of Inanwatan with diethylcarbamazine. *G. Covell*

SOUTH PACIFIC COMMISSION. Noumea, New Caledonia. **Filariasis in American Samoa** [IYENGAR, M. O. T.]. *Technical Information Circular No. 35.* 1959, Sept., 11 mimeographed pp.

American Samoa includes the large island of Tutuila, the Manua group consisting of the three islands Tau, Ofu and Olesega, and Swain's island. The total land area is 76 square miles and the total population about 20,200. With the exception of Swain's island which is a low atoll, all are mountainous. The climate is tropical-oceanic with a rainfall of 196 inches annually.

The microfilaria rate (non-periodic) is 15·9% in Tutuila; the elephantiasis rate is between 1% and 2·6%, and 10·5% of all males above 15 in one survey were shown to have hydroceles. The primary and probably sole vector is *Aëdes polynesiensis*. Probably between 3·6 and 4·6% of these mosquitoes caught in Tutuila are naturally infected with filarial larvae. The important breeding places are, as elsewhere, coconut shells, rat-damaged coconuts, tin cans, rainwater barrels, and tree holes. The night-biting *Aëdes* (*Finlaya*) *samoanus* breeds in large numbers in rainwater collecting at leaf bases of plants such as *Pandanus*, Taor and Tamu, but it is not of importance in the local transmission of filarial infection.

Nearly all villages are provided with piped water supply, and barrels for storing rainwater are practically absent. The major sources of breeding in the village are found in the backyards of houses and the area behind the "pig-wall".

Hyperfilariation is the essential factor in the causation of filarial disease, and a significant amount of transmission is possible when there is a high density of vector mosquitoes in close contact with the human population and this is specially true for filariasis transmitted by *Aëdes polynesiensis*.

It is difficult to make a proper estimation of the total density of a mosquito type which rests primarily in the bush, but the breeding rates are most profuse in and around the villages. Elimination of these breeding sites by simple measures of village sanitation form the main measures of filariasis control.

The following recommendations are outlined:—

1. Around each village an area should be pegged out which should be kept reasonably free of bush and completely free of all litter likely to hold rainwater. The tidy area should extend to a distance of 120 yards from the periphery of the village.

2. Three filariasis control inspectors should be appointed.

3. The village water supply systems must be maintained. In many villages the reservoir is in bad repair, the distribution pipes are corroded and the taps defective. In some when the supply is deficient the people resort to storing water in barrels, which is most dangerous. It is suggested that the responsibility for maintenance should rest with the Government. *Philip Manson-Bahr*

SYMES, C. B. **Observations on the Epidemiology of Filariasis in Fiji. Part I. Field Studies.** *J. Trop. Med. & Hyg.* 1960, Jan., v. 63, No. 1, 1–14, 12 figs. [15 refs.] **Part II. Laboratory Studies and Human Infections.** *Ibid.*, Feb., No. 2, 31–44, figs. 13–14. [14 refs.] **Part III. Control.** *Ibid.*, Mar., No. 3, 59–67.

[See this *Bulletin*, 1960, v. 57, 60.]

FUJISAKI, T. **[Supplements to the Finding on the Susceptibility of Japanese Mosquitoes to *Wuchereria bancrofti*. 2. On the Susceptibility of *Anopheles hyrcanus sinensis* and *Culex tritaeniorhynchus*]** *Endem. Dis. Bull. Nagasaki Univ.* 1959, Sept. 23, v. 1, No. 3, 278–87. [26 refs.] [In Japanese.] English summary.

Between 1955 and 1957 the author studied the susceptibility of *Anopheles sinensis* and *Culex tritaeniorhynchus* to *Wuchereria bancrofti* in Western Kyushu, Japan. These mosquitoes breed over a wide area in rice fields and drains, but are not so abundant in the areas of filariasis endemicity in Western Kyushu which are hilly or rocky.

Results of experiments are summarized, from which it is evident that larvae did not reach maturity in *A. sinensis*, so that it is probably not important as a natural vector of filariasis in Kyushu, which is the most serious endemic area of the disease in Japan.

C. tritaeniorhynchus proved to have low susceptibility, only 4·7% of mature larvae having been found in 128 females. Since this mosquito is largely zoophilic it also appears to be of little importance as a local vector of filariasis.

[This abstract has been prepared from the author's summary in English.]

H. J. O'D. Burke-Gaffney

TANABE, N. **[Immuno-Serological Studies of Filariasis. III. Cutaneous Reaction and Precipitin Test with *Wuchereria* Antigens and Evidence of Antigenicity of Urine from Filariasis Patients]** *Endem. Dis. Bull. Nagasaki Univ.* 1959, Mar. 23, v. 1, No. 1, 38–50. [23 refs.] [In Japanese.] English summary.

Cutaneous and precipitin tests were carried out on 184 patients suffering from *Wuchereria bancrofti* infection with the following 3 antigens:

FH—prepared by dialysis and concentration of 24-hour specimens of urine from infected patients after treatment with diethylcarbamazine;

LX—a saline extract of larvae in mosquitoes;

MFE—an electrolysate of microfilariae from infected blood.

The following positive results were obtained in the cutaneous test:

	Patients	Non-infected controls
FH antigen	29 of 49	8 of 36
LX „	9 of 15	4 of 31
MFE „	22 of 30	all negative

In 15 patients FH and LX were used simultaneously and agreement occurred in 73·3%.

The precipitin test was positive in 15 of 30 patients when the FH antigen was used and there was a 90% agreement in parallel tests with *Dirofilaria immitis* antigen: there was no group reaction with infections by other parasites. The tests were positive more frequently in patients with symptoms.

The author points out that an antigen, probably liberated from dead parasites, was demonstrated in the urine of patients with *W. bancrofti* infection and suggests that a diagnostic antigen-antibody reaction of the urine from

infected patients and serum from rabbits immunized with *D. immitis* antigen may be feasible.

[This abstract has been prepared from the author's summary in English.]

H. J. O'D. Burke-Gaffney

JORDAN, P. **Effect of Prednisolone in Bancroftian Elephantiasis.** *Brit. Med. J.* 1960, Apr. 2, 1020–22, 1 chart. [14 refs.]

Conflicting reports on the role of steroids in the treatment of *Wuchereria bancrofti* elephantiasis [this *Bulletin*, 1954, v. 51, 297; 1956, v. 53, 470; 1958, v. 55, 430] have suggested that further trials were necessary before their efficacy could be ascertained.

The 7 patients in this series came from areas in Tanganyika where *W. bancrofti* filariasis is known to be common: the condition had been present for periods ranging from 1 to 8 years and the severity varied from slight to severe. In every case the skin was thicker than normal; in advanced cases it was verrucose; in 3 the disease was bilateral.

The fluid intake and urinary output were measured for a few days before treatment in order that any diuresis could be more accurately detected. The legs were measured at four levels—mid-thigh, mid-calf, at the ankle and round the foot, before and after treatment. Treatment was begun with twice-daily injections of 1 ml. (25 mgm.) of prednisolone followed by 1 ml. daily in two doses for 25 days. The drug was then slowly withdrawn.

In one patient only was slight diuresis noted. At the end of treatment a lasting reduction of the size of the limb was noted in only one patient, but a slight reduction occurred in all but one of the others; the reduction was greatest in those confined to bed during treatment. For this it could not be claimed that prednisolone was responsible. On becoming ambulant, however, the limbs returned to their previous state.

It is of interest that in previous studies steroids appeared to have most effect on elephantiasis associated with non-periodic filariasis, but much less in the nocturnal periodic variety.

In one patient microfilaraemia increased during treatment, but fell thereafter. It is suggested that in elephantiasis steroids may alter the immune reactions and so prevent the destruction of microfilariae during treatment, but that when treatment is discontinued normal immune body production becomes established and the numbers of microfilariae correspondingly reduced.

Among hospital patients a higher intensity of microfilaraemia was recorded in aborting women and those suffering from trauma. This is probably associated with damaged tissues [*ibid.*, 1954, v. 51, 820]. In view of the effects of steroids on microfilaraemia it seems more likely it is due to hydrocortisone which is increased after trauma and doubled during pregnancy.

Philip Manson-Bahr

MCGOWAN, T. F. **Public Health Engineering Aspects in Filaria Control in India.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1959, Jan., v. 7, No. 1, 3–14.

MENON, M. A. U. & PILLAI, V. M. **"Engineered" Mosquito Breeding in Trivandrum City.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1958, May, v. 6, No. 3, 91–8, 6 figs.

The Trivandrum campaign for the control of *Wuchereria bancrofti* infection requires the destruction of *Culex fatigans* which, because of the development of resistance, cannot be effectively attacked by insecticides in the houses, and is very difficult to kill by larvicides of any sort owing to the nature of the water in which it breeds. Principal reliance is therefore placed on traditional techniques of cleaning, draining and otherwise reducing the water area and exposing it to detailed control and inspection. This is made extremely difficult and sometimes impossible by the forms of engineering, or lack of it, associated with the development of public water supplies. In fact, filarial endemicity in two divisions of the city has risen to 28·6% and 20·4% from previous levels of 19·4% and 15·1% as a result of the introduction of water without adequate or efficient associated drainage. Six illustrations demonstrate the authors' point and demonstrate the need for collaboration with the health authorities in any engineering projects which affect water flow. *G. Macdonald*

IYENGAR, M. O. T., DE ROOK, H. & VAN DIJK, W. J. O. M. **Interruption of Transmission of *Anopheles*-Borne Filariasis by Indoor Residual Spraying in Netherlands New Guinea.** *Trop. & Geograph. Med.* Amsterdam. 1959, Sept., v. 11, No. 3, 287–90.

Both malaria and *Wuchereria bancrofti* infection in Netherlands New Guinea are transmitted solely or principally by mosquitoes of the *Anopheles punctulatus* group. A major malaria control scheme, described elsewhere by METSELAAR [this *Bulletin*, 1957, v. 54, 651] has been in operation since July 1955 and relied on the application twice each year of dieldrin at 0·5 gm./m.² till 1957, and later of DDT at 2·0 gm./m.² No special survey of filariasis was made at the start of this work though it was recorded that 32·9% of the people showed nocturnal microfilariae and this included one of 10 children under 15 years of age. The present investigation, started in January 1959, 6 months after the last application of insecticide, included the examination of 285 of the 300 population in three villages and the dissection of 202 mosquitoes found resting in houses or attracted to human bait. This study showed that none of 98 children under 10 years old and only 2 of 55 (3·6%) aged 10–19 showed microfilariae in the blood, though the rates in the three succeeding 10-year age-groups were considerable: 39·1%, 28·6% and 51·4% respectively. Developing larvae were found in 10 of 133 *A. koliensis* and 4 of 52 *A. punctulatus*, 18 other anophelines dissected being negative. However, all of the filarial larvae found were immature, the oldest being at the middle phase of the second instar. It is concluded that transmission of filarial infections has been effectively interrupted. *G. Macdonald*

i. SASA, M. *et al.* **[Studies on the Control of *Wuchereria bancrofti* Infection in Amami Oshima Island]** *Japanese J. Parasit.* 1959, Dec., v. 8, No. 6, 872–9. [In Japanese.] English summary.

ii. ——— *et al.* **[Studies on the Control of *W. bancrofti* Infection in Ehime]** *Ibid.*, 880–85. [In Japanese.] English summary.

iii. OMORI, N. *et al.* **[Filaria Control Experiments in Western Kyushu, Japan]** *Ibid.*, 886–94, 4 figs. [10 refs.] [In Japanese.] English summary.

iv. HAYASHI, S., SATO, K. & OSADA, Y. **[Studies on the *W. bancrofti* Infection in Aogashima Island of the Izu Archipelago]** *Ibid.*, 895–903, 3 figs. [In Japanese.] English summary.

i. An account is given of a field study in the control of filariasis in 4 villages of Oshima Island, which lies due south of Yokohama. Mass treatment of proved carriers was carried out with Supatonin [diethylcarbamazine] and residual insecticides were used for mosquito control. For mass treatment 3 regimens were adopted:

(a) 2 mgm./kgm. body weight once daily for 5 days, followed by 4 mgm./kgm. body weight daily for 5 days,

(b) 2 mgm./kgm. once daily for 10 days,

(c) 2 mgm./kgm. once daily for 5 days, followed by 2 mgm./kgm. at 10-day intervals for 5 months.

The micofilarial rates in the villages before treatment began varied from 11·8 to 30·2%.

Under regimens (a) and (b) initial results were good, but a gradual increase of the average microfilarial counts was noted from 1 to 4 months after the drug was discontinued. Regimen (c) gave better results, the average microfilarial count dropping to 0·78% after 4 months, observation, compared with 18·03%, 7·63% and 11·60% respectively in the other 3 villages.

Applications of 5% DDT and 0·5% dieldrin emulsions at a dosage of 50 cc. per square metre of wall surface effectively controlled the vector mosquito at least for several months. As has been the case elsewhere there was a considerable increase in the house-fly population a few months after the commencement of spraying.

ii. In this study the incidence of microfilarial carriers in 2 villages under observation was relatively low, 0·48% in one and 3·3% in the other.

Diethylcarbamazine was administered to the carriers in doses of 2 mgm./kgm. body weight once daily for 5 days followed by 4 mgm./kgm. daily for 5 days. After this treatment 10 out of the 30 carriers treated became negative and the average microfilarial count dropped from 27·0 to 3·43.

19 of those remaining positive were given a further treatment of 2 mgm./kgm. daily for 5 days, after which there were still 15 positive carriers out of the original 30. A further 5-day course with the same dosage was administered 3 months after the initial treatment, but the number of positive cases remaining was again 15.

Mosquito control with 0·25% dieldrin emulsion, 40 cc. to the square metre of wall surface, resulted in a great reduction of the vector species of mosquito. Flies were at first markedly reduced in number, but by the end of 4 months these had increased to about 4 times the number of the original.

iii. Filariasis control experiments were carried out in 3 small islands lying off the west coast of Southern Japan, where *Culex pipiens pallens* appears to be the only vector. DDT or dieldrin sprays were applied to the walls of houses at 50 cc. per square metre on alternate strips of surface measuring 30 cm. wide. 1% DDT emulsion was also sprayed on mosquito breeding

places in 2 of the 3 islands. There was a marked reduction in the numbers of mosquitoes, but the effect of house spraying did not persist for longer than 6 weeks unless reinforced by treatment of breeding places.

Mass treatment with diethylcarbamazine is being administered to all persons over 5 years of age in a dosage of 2 mgm./kgm. body weight in the first island daily for 10 days, in the second once weekly for 10 weeks and in the third, once monthly for 10 months. The results of this experiment will be reported at a later date.

iv. The island on which this experiment was conducted lies off the coast of Japan, almost due south of Yokohama. All of the inhabitants, numbering 317, were examined for microfilariae and 41 persons (12·9%) were found positive for *Wuchereria bancrofti*. The local mosquito vector is *C. pipiens pallens*.

Diethylcarbamazine was administered to all detected carriers at a daily dose of 2 mgm./kgm. body weight for 5 days and 6 mgm./kgm. for the following 8 days. Out of 12 persons re-examined 7 days after the beginning of treatment 3 had become negative and the average number of microfilariae in the blood was reduced to 14·3% of the initial count.

The houses were sprayed with DDT (2 gm. sq. metre). This resulted in a precipitous reduction in mosquitoes and flies, but since the authors' visit was limited to 3 weeks no assessment could be made as to the long-term result.

G. Covell

EDESON, J. F. B. **Studies on Filariasis in Malaya: The Periodicity of the Microfilariae of *Brugia malayi* and *B. pahangi* in Animals.** *Ann. Trop. Med. & Parasit.* 1959, Dec., v. 53, No. 4, 381–7, 4 figs.

The periodicity of microfilariae of *Brugia* (*Wuchereria*) *malayi* and *B. pahangi* was studied in various animal hosts. In cats the microfilariae of *B. malayi* were periodic with a peak usually occurring during the night, but there was much variation between individual cats [possibly the habits of the cats were also different]. During the day-time the blood often contained 12–50% of the number of microfilariae seen at the peak. The general form of the periodicity curve in cats was similar to that in a naturally infected man [this *Bulletin*, 1958, v. 55, 293]. In 2 monkeys (*Macaca irus*) the periodicity was also nocturnal. In one slow loris, the microfilariae were also nocturnally periodic.

Infections of *B. pahangi* in cats, slow loris and dog were also semi-periodic with a peak during the night, but the blood contained fair numbers of microfilariae during the day as well.

[The periodic cycle of microfilariae is orientated to the 24-hour rhythm of the host, whether man or animal; consequently if an individual host has abnormal timing of his 24-hour cycle, the cycle of the microfilariae will be correspondingly abnormal.]

F. Hawking

EDESON, J. F. B. & LAING, A. B. G. **Studies on Filariasis in Malaya: the Effect of Diethylcarbamazine on *Brugia malayi* and *B. pahangi* in Domestic Cats.** *Ann. Trop. Med. & Parasit.* 1959, Dec., v. 53, No. 4, 394–9, 3 figs. on pl.

Hitherto there has been some uncertainty about the effect of diethylcarbamazine upon the adult worms of *Wuchereria bancrofti* or *Brugia* [*W.*]

malayi because it is not possible to obtain the worms from man after treatment for direct examination; but since after adequate treatment with this drug the microfilariae disappear and do not come back again, it has been concluded that the adult worms have been killed or permanently sterilized [this *Bulletin*, 1956, v. 53, 638, 1039]. The work reported in the present paper describes direct observations of adult worms which have been established in cats. Doses are given in terms of base (1 gm. base = 2 gm. citrate). Cat 1 was infected by mosquitoes from man and had shown microfilariae for 6 months when treatment began. A total dose of 1·3 gm. per kgm. was given by mouth during 71 days; the microfilaria count became negative by the 64th day of treatment. The cat was killed 35 days after treatment ended. All the worms found were dead and calcified. Cat 2 was infected by mosquitoes from man and it had been positive for a month. The dose was 3·5 mgm. per kgm. by mouth at weekly intervals for 6 weeks. During treatment the microfilarial count increased from 95 to 184 per 60 cmm. The cat was killed 1 week after the last dose. One healthy female and many calcified worms were found.

Cat 3 had been positive for 6 weeks. The dose was 3·9 mgm. per kgm. by mouth daily for 14 days. The microfilarial count fell from 103 to 11 per 60 cmm. The cat was killed 9 days after the last dose. One male and 2 female worms were alive and many others were partly calcified and partly alive.

Cat 4 had been positive for 7 months. The dose was 5 mgm. per kgm. injected intraperitoneally daily for 3 days and later 10 mgm. per kgm. daily for 15 days. The microfilarial count fell from above 500 to below 50 per cmm. The cat was killed 3 days after treatment. Only dead worms were found.

Cat 5 had been positive for 7 months. The dose was 5 mgm. per kgm. intraperitoneally daily for 7 days and later 5 mgm. intramuscularly daily for 6 days. The microfilarial count fell from 650 per 60 cmm. to less than 100. A further course of 10 mgm. intraperitoneally was given daily for 7 days. Microfilariae persisted in reduced numbers for 10 months and they were infective to mosquitoes. The cat has not yet been killed.

Cat 6 had been positive for 2 months. The dose was 5 mgm. per kgm. for 6 days and 10 mgm. per kgm. daily for 9 days by injection. The microfilarial count fell from 145 to less than 10 per 60 cmm. When the cat was killed after 6 months, no adult worms could be found.

Cat 7 had been positive for 5 months. The dose was 70 mgm. per kgm. for 6 doses in 9 days. The microfilarial count fell from 200 to less than 20 in 60 cmm. after the first injection and remained at this low level. The cat was killed 2 weeks after treatment; only calcified remains of 3 worms could be found.

Cat 8 had a natural infection with *B. pahangi*. The dose was 10 mgm. per kgm. by injection for 6 days. Microfilariae fell from 260 to 50–100 per cmm., and were absent 10 months later.

Cat 9 had a natural infection with *B. pahangi*. The dose was 10 mgm. per kgm. by injection daily for 7 days. The microfilarial count fell from 500 to less than 100 per cmm. The cat was killed 10 days after treatment and 4 dead worms were found.

Cat 10 had been positive for *B. pahangi* for 3 months. The dose was 50 mgm. per kgm. daily for 6 days. The microfilarial count was reduced from 300 to less than 120 in 60 cmm. The cat was then given 100 mgm., 3 doses

in 4 days and it died by misadventure. 2 partly calcified living worms and many dead ones were found.

Cat 11 had been positive for *B. pahangi* for 5 months. It was given a single dose of 100 mgm. per kgm. which caused vomiting and diarrhoea. The microfilariae fell from 1,000 to 500 per 60 cmm. The cat was killed 10 days later. One live worm, one partly calcified live worm and 5 dead calcified worms were found.

It is concluded that diethylcarbamazine will kill the adult worms; death may be delayed for more than 10 days after treatment.

[This is a valuable paper confirming the previous supposition that diethylcarbamazine has a direct lethal action on the adult worms of *Brugia malayi* (and presumably also, of *W. bancrofti*). This work raises the interesting query why some microfilariae should resist the action of diethylcarbamazine, while the other microfilariae are quickly killed and the adult worms are slowly killed. Are these a different type (? sex) of microfilaria or are they at a different stage of development? At any rate, they seem still capable of infecting mosquitoes (Cat 5).] *F. Hawking*

Krishnaswami, A. K., Krishnan, K. S., Raghavan, N. G. S. & Bhatnagar, V. N. **Studies in Transmission of Filariasis. I. Effect of *D. repens* Infection on the Longevity of *Aëdes aegypti*.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1959, May, v. 7, No. 3, 95–101, 2 graphs.

Females of *Aëdes aegypti* were fed on dogs infected naturally with *Dirofilaria repens* and were then kept in cages at 80°F. and 80% relative humidity and maintained on glucose solution. The mortality of infected females was found to be highest (32·3%) during the first 5-day period after the feed. Mortality among females fed on uninfected dogs was low (5·9%) during this period. [There is no indication of the numbers of mosquitoes used in these experiments.]

The authors suggest that higher rates of mortality are found in mosquitoes fed on hosts with larger numbers of microfilariae in the blood. The percentage mortalities recorded on the day following feeds on dogs with 0, 1–49, 50–99, 100–199 and above 200 microfilariae per 20 cmm. of blood were, respectively, 1·8, 1·8, 9·5, 12·6 and 22·2.

There was no evidence of any increase in daily mortality when infective stages of *Dirofilaria* were present, about 11 or more days after the blood meal. [See also this *Bulletin*, 1954, v. 51, 83; 1958, v. 55, 673.] *B. R. Laurence*

Taylor, Angela E. R. & Terry, R. J. **The Effect of Antifilarial Drugs on the Embryonic Development of *Litomosoides carinii*, of the Cotton-Rat.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Jan., v. 54, No. 1, 33–6, 27 figs. on 3 pls. [14 refs.]

Cotton-rats infected with the filarial worm *Litomosoides carinii* were treated with Pentostam (sod. stibogluconate) 200 mgm./kgm. intraperitoneally daily.

At the end of 6 days' treatment the adult female worms were still capable of movement, but their later embryonic stages in the uterus were completely degenerate and disorganized; the early stages, *e.g.* the oöcytes and embryos up to the 8-cell stage, showed degeneration of the nuclei and cytoplasm. After two doses only slight changes were present, and after 4 doses considerable degeneration had occurred. Other rats were treated with a trivalent arsenical compound (K 324) which resembles Arsenamide [this *Bulletin*, 1950, v. 47, 1023]. After 2, 4 or 6 doses similar severe damage and degeneration were seen in all the embryonic stages. Other rats were treated with Cyanine 863 [*ibid.*, 1949, v. 46, 763]; this compound also caused degeneration of all the embryonic stages, particularly of their nuclei; when examined by the fluorescent microscope there was evidence that this compound accumulates particularly in the nuclei. Two new compounds BIQ 13 and BIQ 18 (1:18 hexadecamethylene bis (isoquinolinium iodide)) [*ibid.*, 1959, v. 56, 553] were tested on worms *in vivo*. These compounds caused degeneration, particularly of the oöcytes and early stages while the later embryos were comparatively little affected. Diethylcarbamazine was tested both *in vivo* and *in vitro*; there was no evidence that it caused any harm to the adult worms or to the embryos.

These observations show that drugs may cause severe damage to the developing embryos even in doses which do not kill the adult worms; the susceptibility of the embryos is probably due to their high metabolic activity and to their active growth and development. *F. Hawking*

JOPLING, W. H. **Onchocerciasis Presenting without Dermatitis.** [Memoranda.] *Brit. Med. J.* 1960, Mar. 19, 861.

Swelling of a limb, without skin rash or irritation, may be the presenting sign of *Onchocerca volvulus* infection. The author, from the Hospital for Tropical Diseases, London, records 2 such cases in English patients aged 37 and 31 who had been in Uganda for 15 and 6 years respectively. The first patient developed pain in the right shoulder and diffuse swelling of the hand and forearm one month after arrival in Britain. Within 2 months the swelling had increased and involved the right shoulder, but disappeared within a month or so. There were no clinical abnormalities. No microfilariae were found in the blood, but there was some leucocytosis, with 60% eosinophils. The filarial skin test and complement fixation were positive, the latter strongly so. A few embryos of *O. volvulus* were found in skin shavings.

The second patient showed a similar initial course 6 months after arrival in Britain. The right shoulder was painful and became swollen 2 months later. These symptoms persisted and were aggravated by lying on that side, by exercise and by carrying articles in the right hand. After exercise such as tennis the swelling increased and involved the upper arm. There was no dermatitis or itching. She was seen 2½ years later: the swelling of the shoulder was firm, non-pitting and resembled a Calabar swelling. No microfilariae were found in the blood, leucocytosis was not striking and eosinophils were 18%. The filarial complement-fixation test was weakly positive and numerous embryos of *O. volvulus* were found in skin shavings from the right shoulder only.

Loiasis could reasonably be excluded as it is not endemic in Uganda. A

Calabar swelling usually disappears rapidly. The clinical features and absence of microfilariae from the night blood excluded *Wuchereria bancrofti* infections, taken with the facts that there was no lymphatic involvement, spontaneous clearing occurred in one patient, and only the proximal part of the limb was involved in the other. *H. J. O'D. Burke-Gaffney*

PAINE, D. H. D., LOWER, E. S. & COOPER, T. V. **Treatment of Trichuriasis with Dithiazanine in a Hospital for Mental Defectives.** *Brit. Med. J.* 1960, Mar. 12, 770–74.

This report, from Coldharbour Hospital, at Sherborne in Dorset, describes an initial pilot trial followed by a mass elimination campaign against trichuriasis among mental defectives and their attendant staff.

The initial experiment comprised a treated group of 12 patients matched for intensity of infection by a control group of 12 patients. Initial Stoll counts were carried out to assess egg output, though the authors do not claim that this bears a constant relationship to worm load. Treatment by 200 mgm. of dithiazanine iodide thrice daily was maintained for 5 days, extra doses being added at the end of this period for every one vomited. Since the drug was held to cause constipation 2 tablets of Senokot were given each day. The stools were examined for the presence of worms each day and *Trichuris* recovered were placed in distilled water for 24 hours to test their viability: this investigation was continued for 10 days and then weekly for 3 weeks. A most careful set of investigations were carried out to determine whether the drug might exert toxic effects. These included haemoglobin and serum albumin estimations, leucocyte counts, blood urea estimations and urinalysis. Vomiting emerged as the only important side effect: this affected 7 out of the 12 treated patients, and was most frequent on the first and second days of treatment. No toxic effects on bone marrow, serum or kidneys were demonstrated. The anthelmintic effect was excellent. In each treated patient non-viable worms were excreted between the 3rd and 5th day, but none were excreted by the control group. All the treated patients, except one ceased to pass ova, but all the controls continued to do so.

An elaborate mass treatment campaign was then planned with the object of total eradication of trichuriasis from the population of the hospital. Every single patient, and those members of the staff who consented (the group who were unwilling to receive treatment were all free from trichuriasis) received a 5-day course of treatment, comprising dithiazanine iodide 600 mgm. daily without purgatives, with additional doses to replace those which had been vomited. Patients were confined to the wards during the treatment period, and were then bathed, dressed in clean clothing and transferred to 4 empty and long-unoccupied wards. Meanwhile paths, dustbins and entrances were sterilized with flame guns. The original wards were then vacuum cleaned and sterilized, and the patients returned to them after a 10 days' absence.

The results were assessed 3 months later. 76 out of 82 *Trichuris* carriers had become negative (93%), though of these 18 had been treated in a previous clinical trial. 5 of those still positive required 3 courses of treatment, and the remaining patient was cleared after 4 courses.

Among the staff, one outside worker who was much addicted to cider remained positive after 8 courses of treatment, but when a ninth course was given after a week's total abstinence from alcohol, cure resulted.

The hospital was free from infection many months later.

[For an earlier study by the authors, see this *Bulletin*, 1959, v. 56, 644.]

J. H. Walters

WHITE, R. H. R. & SCOPES, J. W. **A Single-Dose Treatment of Threadworms in Children.** *Lancet*. 1960, Jan. 30, 256–8, 1 chart. [18 refs.]

Threadworms are undesirable parasites within the colon of children, since, in addition to giving rise to perianal irritation and restless sleep, there is considerable evidence that they may enter and irritate the appendix, and may cause a breach in its mucosal lining through which bacteria may invade its wall [this *Bulletin*, 1957, v. 54, 1448]. A high proportion of urban children still carry this infection.

The authors report the results of a clinical trial of a palatable compound containing piperazine phosphate and standardized senna, in the form of granules, which is marketed under the name of Pripsen by the Westminster Laboratories Ltd. 40 grains of these granules (about 1 teaspoonful) contain piperazine phosphate 1 gm. and 7 mgm. of sennosides A and B. As a control, granules of identical appearance but lacking the senna component were also supplied. Children of 2–5 years were given 120 grains ≡ 3 gm. piperazine phosphate, those of 6–12 years received 160 grains ≡ 4 gm.

182 children who were patients in the Evelina Children's Hospital, in whom the diagnosis of enterobiasis had been established by the identification of ova in a perianal Cellophane swab, were treated alternately with Pripsen and with the control piperazine granules. After the single dose treatment, perianal swabs were taken each morning for 10 days. A cure was recorded when the daily swabs became negative by the 4th day and remained so for the next 7 days. 60 children were discharged prematurely so that 122 completed the trial period and the results from these were analysed. Of 59 who had received Pripsen, cure was obtained in 57 (97%), while of the 63 who received the control granules, which contained piperazine only, 58 (92%) were judged as cured.

Both compounds proved to be non-toxic. 4 children vomited immediately after swallowing Pripsen granules; in the remainder this preparation gave rise to 1–4 loose motions without discomfort on the following day.

Since in a minority of treated children ova continue to appear on the perianal swab for 1–3 days and are likely to cause re-infection, repetition of the single dose treatment after an interval of 1–2 weeks seems desirable.

[This form of treatment merits wide recognition by reason of its simplicity and effectiveness, and of its complete lack of toxic side effects, see also this *Bulletin*, 1954, v. 51, 86; 1958, v. 55, 1150.]

J. H. Walters

See also p. 729, GONZÁLEZ BARRANCO & MAZZOTTI, Tolerancia a la administración del tetracloretileno emulsionado en niños escolares. [**Tolerance of Emulsified Tetrachlorethylene in Schoolchildren**]

SHEFFIELD, H. G., MEISENHELDER, J. E. & THOMPSON, P. E. **The Effects of Reference Anthelmintics against** *Nematospiroides dubius* **and Oxyurids in Mice relative to Screening Procedures for New Drugs.** *J. Parasitology.* 1959, Dec., v. 45, No. 6, 653–8.

The authors have studied the technique of screening new compounds against helminthic infections in the laboratory. For this purpose they used *Nematospiroides dubius* in mice (a nematode living in the upper part of the small intestine), *Syphacia obvelata* (living in the caecum) and *Aspiculuris tetraptera* (living in the large intestine) [this *Bulletin*, 1953, v. 50, 235]. *Syphacia* and *Aspiculuris* are common spontaneous infections of mice, and *Nematospiroides* is maintained by a technique which is described. All three infections were present in the mice at the same time. The drugs were given by gavage or in the diet. Treatment was given for 1 to 6 days. The mice were then starved for 24–30 hours and were then killed; the number of worms present in the treated mice was compared with the number in control untreated mice. Certain standard anthelmintic drugs were given to evaluate the reliability of the technique for testing.

Piperazine hexahydrate was active against all three worms. Phenothiazine was ineffective against *N. dubius* but effective in large doses against the oxyurids. Tetrachlorethylene and carbon tetrachloride were active against all three; but santonin and oil of chenopodium were ineffective. Hexylresorcinol was not very active. Gentian violet, pyrvinium chloride and dithiazanine were active against the oxyurids but not against *N. dubius*. Bephenium cured about 57% of the mice with *N. dubius* but had little effect on the oxyurids.

From these experiments it is concluded that a new compound should be tested both by gavage (2 doses during 24 hours), and by drug diet for 6 days, and that the doses required for mice are generally much higher (in relation to body weight) than those required for man. In searching for new anthelmintics, more than one species of worm should be employed; and results obtained in laboratory tests with mice are only a rough guide to what may be hoped for in man or larger animals. [Nevertheless the laboratory tests are a most useful preliminary step in the process of identifying organic compounds which may ultimately prove to be valuable in therapy.]

[For laboratory tests with *N. dubius*, see also the paper by LYNCH and NELSON, in the same journal, pp. 659–662; they mention a new compound—No. 1871, 2-thienylmethyl 2-imidazolinyl sulphide hydrochloride—which appears to be active.] *F. Hawking*

KOZAR, Z. Problemy patogenezy i terapii włośnicy (Trichinellosis). **[Pathogenesis and Treatment of** *Trichinella* **Infection]** *Postepy Hig. Med. Dośw.* Warsaw. 1959, v. 13, No. 5, 587–628. [209 refs.]

A general review and discussion.

DEFICIENCY DISEASES

HOLEMANS, K. Etudes sur l'alimentation en milieu coutumier du Kwango. I. Ingestion calorique et unité de consommation. [**Studies on Nutrition in the Kwango Region. I. Calorie Intake and Unit of Consumption**] *Ann. Soc. Belge de Méd. Trop.* 1959, Aug. 31, v. 39, No. 4, 349–59, 3 graphs. II. L'enquête familiale directe. [**II. Direct Family Survey**] *Ibid.*, 361–73. III. Régime et besoins (azote, calcium et phosphore) chez l'enfant et l'adulte. [**III. Regime and Requirements in Children and Adults**] *Ibid.*, 375–83. [11 refs.] IV. Le régime de l'enfant au sein. [**IV. Regime in Breast Fed Infants**] *Ibid.*, 385–95. [12 refs.]

I. In a report on calorie requirements, the Food and Agriculture Organization of the United Nations [*Bull. Hyg.*, 1958, v. 33, 59] considered that the Reference Man requires 3,100 calories daily while the Reference Woman requires 2,300 calories [to be precise, the caloric requirements of the Reference Man were put at 3,200 daily]. The author has examined these figures in relation to Africans living in the Kwango area. He found in his subjects a close correlation between body weight and food intake expressed as gm. dry-weight/kgm. body weight/24 hours, and a big difference between subjects of different weight. On the other hand, he calculated that the caloric intake per cm. of height was constant, and observed that there was practically no difference between the amounts of food taken by men and women subjects in the Kwango—where women work in the fields. In the Kwango therefore, women as well as men can be regarded as whole Consumption Units, while children average 0·62 of a Consumption Unit. The sex and age pattern of the local population is such that 1,000 inhabitants represent 810 Consumption Units.

[The author has said that whereas consumption per unit of body weight alters with total body weight, consumption per unit of body height remains constant. This conclusion is based on a relationship between consumption and body weight in one group of subjects, and relationship between body weight and body height in another group. There is no direct comparison of body heights with caloric intakes. A considerable but unspecified proportion of the subjects in each group were children, but the influence of age on the correlations obtained between weights, heights, and food intakes is not discussed. It is possible, for example, that consumption by young children may have increased *pari passu* with height.

In support of his conclusion, the author quotes DAVIS and SCOULAR (J. *Nutrition*, 1957, v. 61, 289), who found that in college women in Texas caloric intake per cm. of height was more nearly constant than intake per kgm. of weight. Their subjects however were highly comparable in age, economic status, and occupation, and variations both in caloric intakes and in body heights were much smaller than variations in body weights.]

II. A direct enquiry into the dietary customs of the families in the Kwango, along with a survey of food production in the territory and laboratory analysis of food samples, suggested that the average diet there has the following characteristics: 100 gm. dry-weight contains 91 gm. carbohydrate, 5·7 gm. protein, 3·2 gm. fat, 122 mgm. calcium, and 160 mgm. phosphorus.

III. The author has found that the requirements of the Kwango child for

calcium and phosphorus are met after weaning (10 kgm.), whereas the nitrogen demand is not fully met in the weaned infant and is attained only when he reaches, at a time much later than in the white, a weight of 20 kgm. After the age of 10–11 years the situation is satisfactory.

IV. Before weaning, that is, from 0 to 2½ years of age, the requirements of Kwango infants for calories, calcium, and phosphorus are met, but not for nitrogen; between the ages of 4 and 9 months an adequate retention of nitrogen is impossible in the average suckling. *C. S. Leithead*

HOLEMANS, K. La courbe de croissance pondérale des enfants du milieu coutumier de Feshi (Kwango). [**The Curve of Weight Increase in Children of the Feshi Area**] *Ann. Soc. Belge de Méd. Trop.* 1959, Aug. 31, v. 39, No. 4, 397–416, 5 graphs. [30 refs.]

From a large number of measurements, the curve of weight increase in children of the Feshi territory [Kwango] is constructed and described, and compared with that reported by other authors for American children.

Between the ages of 6 months and one year, the curve of weight increase in Feshi children begins to lag behind that of their American counterparts, and there is a further lag around puberty. The net result is that Feshi children reach adult weight 2–3 years after American children.

The author has examined the influence of malaria, other febrile disorders, intestinal worms, and dietary deficiencies on the rate of growth of Feshi children. He concludes that in the Kwango chronic lack of dietary protein is the principal cause of retarded growth. *C. S. Leithead*

DARKE, Sylvia J. **The Cutaneous Loss of Nitrogen Compounds in African Adults.** *Brit. J. Nutrition.* 1960, v. 14, No. 1, 115–19. [14 refs.]

The daily loss of nitrogen from the skin was measured in 14 Africans, all adult males. The measurements were made by collecting the material in a sweat-suit over 24 hours. The subjects were convalescent patients, ward orderlies and laboratory assistants. Daily temperatures ranged from a minimum of 14° to a maximum of 32°C. The mean daily loss was 254 mgm. of N (s.e. 23) and the maximum loss by any individual was 480 mgm. A table gives the results of 6 previous investigations of the daily loss of nitrogen in the sweat, in which the mean daily loss was reported to vary from 71 to 460 mgm. *R. Passmore*

LUKÁCS, F. V. **Kwashiorkor in Korea.** *Acta Med.* Budapest. 1960, v. 15, Nos. 1/4, 265–6.

"In the Fange province of North Korea, an area from where kwashiorkor has not been reported, 16 children suffering from the condition were observed. The majority was fed on a rice or vegetable diet. The disease displayed the same pattern as under the tropics. From among skin changes, depigmentation and desquamation occurred: oedema was manifest in all children but four: serum protein values were below normal. Nine of the patients were discharged

after full recovery, 3 in an improved state. Four children died, one from tuberculosis, one from septicaemia and in two the grave state could not be relieved."

EDOZIEN, J. C., PHILLIPS, E. J. & COLLIS, W. R. F. **The Free Aminoacids of Plasma and Urine in Kwashiorkor.** *Lancet.* 1960, Mar. 19, 615–18, 3 figs. [28 refs.]

The amino-acids in plasma and urine of 25 normal Nigerian children and of 50 children with kwashiorkor were examined. The findings in healthy children did not differ in any significant respect from those described for European children and adults. In kwashiorkor, chromatography of the plasma amino-acids showed a generally low level, and this was confirmed by estimation of the total free amino-acids according to Folin and by the ninhydrin technique. The amino-acids were not all equally affected, but cystine, methionine, valine and tryptophan were among those which were particularly low in concentration. It was notable that lysine did not belong to this group. Whereas ethanolamine and β-aminoisobutyric acid could not be detected in the normal plasma chromatograms, the first was clearly visible in about 75% and the second in 30% of the cases of kwashiorkor.

Urines from patients with kwashiorkor contained quantitatively more amino-acids than the normal urines. This high aminoaciduria is thought to be of renal origin. The non-essential amino-acids were more affected than the essential amino-acids. Ethanolamine was excreted in 80%, and β-amino-isobutyric acid in every case: indeed, in many of the pathological urines it was the dominant amino-acid spot. When a diet supplemented with methionine was given, the plasma amino-acids rose, and ethanolamine in the urine either fell or disappeared. The excretion of β-aminoisobutyric acid was not affected by methionine.

The authors suggest that the ethanolaminuria in kwashiorkor, which is usually thought to be a sensitive indication of nutritional liver damage, is not a result of liver damage but of a metabolic block in the utilization of this amine for the synthesis of choline. This block would result in a deficiency of methyl donors which, in the authors' feeding test, was corrected with methionine. *H. Lehmann*

CHAUDHURI, K. C., NAGGHAUDHURI, J. & GHOSAL, S. P. **A Study of Alpha-Keto-Acids in Protein Malnutrition.** *Acta Med.* Budapest. 1960, v. 15, Nos. 1/4, 57–63.

STEIN, H. & ISAACSON, C. **Cirrhosis of the Liver in Childhood: its Relationship to Protein Malnutrition (Kwashiorkor).** *Med. Proc.* Johannesburg. 1960, Jan. 16, v. 6, No. 1, 7–13, 7 figs. [40 refs.]

Every year 600–800 children are admitted to the Baragwanath Hospital, Johannesburg, suffering from kwashiorkor. About 20% of these die and several hundred have come to autopsy. Yet very few children are seen in the hospital with cirrhosis of the liver and these present a diversity of types,

similar to those found in children with a satisfactory nutritional background. The authors provide an excellent review of these varied types of hepatic cirrhosis in children. They conclude that a poor nutritional background does not necessarily lead to an increased incidence of cirrhosis. In under-developed countries where the disease is common, for example Jamaica, the aetiological factor may be some dietary toxin. This excellent review, in which the main conclusion is made abundantly clear, is completed by a useful bibliography of the subject. *R. Passmore*

CARVALHO, A. Histopatologia de lesões hepáticas atribuíveis à desnutrição em indivíduos de O à 15 anos de idade, no Recife, Pernambuco, Brasil. **[Histopathology of Liver Lesions attributed to Malnutrition in Children under 15 years of age in Recife, Pernambuco, Brazil]** *Anais Facul. Med. Univ. do Recife*. 1957, July, v. 17, No. 1, 11–33, 4 figs. [Numerous refs.] English summary pp. i–ii.

After a review of the considerable literature on liver lesions in relation to malnutrition, the author describes a study made on necropsy material from 78 children under the age of 15 in Recife between 1950 and 1955. All the children came from the poorer part of the city and had received diets poor in protein. Macroscopic and microscopic examination of the liver was made, together with some histochemical studies where these were appropriate.

The results are set out and discussed under the headings of steatosis, siderosis, proliferative phenomena and infiltrative phenomena. There are 4 photomicrographs and 4 tables.

Perilobular fatty change, similar to that seen in kwashiorkor, was found in 54 cases. It differed in incidence from that of kwashiorkor in that some two-thirds of the cases occurred in infants less than 1 month old and this early appearance is attributed to deficient breast feeding.

Siderosis was detected in 26 of 32 cases studied for this purpose. It was present in a high proportion of children under 1 year of age and in all under 1 month which suggests to the author a physiological process. It followed, in general, the pattern described in pellagra, but was not related to the intensity (classified in 5 grades) of the fatty changes in the liver. Fatty cysts were found in more than two-thirds of the livers.

Sinusoidal compression, collapse and ischaemia resulted from the increased volume of the fatty hepatic cells. The ensuing juxtaposition of reticulin fibrils simulated thickening of the reticulin network.

Periportal fibrosis was detected mainly in children more than 1 year old. Fibrotic lesions increased and fatty changes decreased with age and it is suggested that there is some continuity of the lesions.

H. J. O'D. Burke-Gaffney

See also p. 753, RODGER, **Personal Observations on some Metabolic Diseases of the Eye.**

See also p. 754, MCLAREN, **Malnutrition and Eye Disease in Tanganyika.**

See also p. 754, BLUMENTHAL, **Malnutrition Keratitis.**

HAEMATOLOGY

VELLA, F. **Thalassaemia: an Enzyme Defect?** *Med. J. Malaya.* 1959, Dec., v. 14, No. 2, 116–21. [38 refs.]

A general review and discussion.

VELLA, F. **Haemoglobin A_2 Estimations by Starch Block Electrophoresis.** *Med. J. Malaya.* 1959, Sept., v. 14, No. 1, 31–5. [16 refs.]

"Using a technique of starch block electrophoresis, the concentration of haemoglobin A_2 in 82 healthy blood donors of different ethnic groups has been estimated. The range was found to be 0·00–2·51%, with averages of 1·67%, 1·78%, 1·95% and 1·72% for Malay, Indian, European and Chinese groups respectively.

"In 9 subjects with Thalassaemia minor the range was 2·67–5·56% and the average 4·08%.

"In 9 non-Thalassaemic subjects with anaemia, the average was 1·95%."

MACIVER, J. E. & WENT, L. N. **Sickle-Cell Anaemia complicated by Megaloblastic Anaemia of Infancy.** *Brit. Med. J.* 1960, Mar. 12, 775–9, 6 figs. [18 refs.]

5 examples of the above pathogenic combination are described, all in infants aged between 10 and 14 months. The infants were either poorly nourished or subject to recurrent infections, or both; and in all the bone marrow was megaloblastic and the anaemia very severe (average Hb 3·4 gm./100 ml.). Response to folic acid (10 mgm. per day) was dramatic, and the Hb rose to levels usual in sickle-cell anaemia.

In Case 1 it was of interest that a blood transfusion had been given 59 days before, and that only 1% of the circulating erythrocytes were now capable of sickling. The child's own erythrocytes had therefore been almost eliminated. As his Hb level had been 12·4 gm./100 ml. after transfusion, and was 6·3 gm./100 ml. 59 days later, the life span of the donor cells must have been about 120 days, and in fact the linearity of disappearance of donor Hb could be confirmed in its second 60 days because data on the total Hb and the proportion of Hb S were available. In this case, too, the capacity of reticulocytes for sickling was neatly demonstrated by observing that at the height of the reticulocyte response to folic acid, sickling cells had appeared in numbers equivalent to those of the reticulocytes.

These 5 cases of the mixed syndrome occurred among 50 infants with megaloblastic anaemia, studied by the authors in Jamaica, much more frequently than would be expected by chance alone, suggesting that infants with sickle-cell anaemia are unduly prone to develop megaloblastic anaemia in Jamaica. Further, the authors have encountered only 1 aplastic crisis in sickle-cell anaemia, and no crises that could be described as haemolytic. Their experience is that "megaloblastic crisis" seems to be the major cause of severe anaemic episodes in infants with sickle-cell anaemia.

[See also this *Bulletin*, 1957, v. 54, 869.] *Alan B. Raper*

VENOMS AND ANTIVENENES

Pesce, H. & Lumbreras, H. Ofidismo en Lima, por " Bothrops picta ". [**Snakebite by *Bothrops picta* in Lima, Peru**] *An. Facul. de Med.* Lima. 1956, v. 39, No. 3, 1152–88, 27 figs. [27 refs.]

A full account with reports of 10 cases in Lima.

Roger, F., Lamy, R. & Roger, A. Sur le titrage des sérums antivenimeux. II, Le pouvoir toxique du venin de vipère (*Vipera aspis*) pour la souris inoculée par voie nasale. Sa neutralisation par les sérums antivenimeux spécifiques. [**Titration of Anti-Venom Sera. II. Toxicity of *Vipera aspis* Venom for Intranasally Inoculated Mice; its Neutralization by means of Specific Anti-Venom Sera**] *Ann. Inst. Pasteur.* 1960, Apr., v. 98, No. 4, 569–76, 4 figs. on 2 pls.

The English summary appended to the paper is as follows:—

" By means of intranasally inoculated venom into mice under ether narcosis, it is possible to induce in the lungs of the animals two main manifestations of the Viperidae bites: important local reaction phenomena and the preponderance of vascular implication.

" The observed phenomena are neutralized by specific immune serum and may be used for the biological titration of anti-venom sera."

Carey, Jocelyn E. & Wright, E. A. **The Toxicity and Immunological Properties of some Sea-Snake Venoms with particular reference to that of *Enhydrina schistosa*.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Jan., v. 54, No. 1, 50–67, 7 figs. [20 refs.]

The commonest and most poisonous of the sea-snakes is *Enhydrina schistosa* [this *Bulletin*, 1958, v. 55, 314]. The LD50 of the venom for ordinary laboratory animals on a weight basis is of the same order, the values falling between 50 and 130 μgm./kgm. It is estimated that the LD50 for man is about 50 μgm./kgm. and that an average bite by *E. schistosa* would be expected to contain 4 LD50. The toxicity of the venom is 4–5 times greater than that of the cobra in terms of μgm. per kgm of mouse, but the venom yield of the latter is very much greater than that of *E. schistosa*. The main toxic fraction of cobra venom is resistant to heat and is electronegative at *p*H 9·8 while the toxic fraction of *E. schistosa* venom is largely destroyed at 100°C. in a few minutes and it is electropositive. Various methods for the preparation of a specific antivenene were tried but in no case was it possible to obtain an antiserum of a potency sufficiently high for it to be regarded as having any significant therapeutic value.

In *in vitro* cross immunity tests there was a distinct immunological relationship between the venoms of *E. schistosa* and other members of the Hydrophiinae, so that if the difficulty of preparing an antivenene of high potency is overcome, a polyvalent antiserum against the dangerous sea-snakes might be a

practical proposition. Antivenenes against krait, cobra, Russell's viper and *Echis* showed only negligible neutralization of the venom of *Enhydrina schistosa*. *H. J. Bensted*

CAREY, Jocelyn E. & WRIGHT, E. A. **Isolation of the Neurotoxic Component of the Venom of the Sea Snake,** *Enhydrina schistosa*. [Correspondence.] *Nature*. 1960, Jan. 9, v. 185, 103–4, 1 fig.

FREIRE-MAIA, L., FERREIRA, M. C. & DA SILVA, C. G. Hiperglicemia na intoxicação escorpiônica experimental em cão. [**Hyperglycaemia in Experimental Scorpion Poisoning in the Dog**] *Mem. Inst. Oswaldo Cruz*. 1959, Oct., v. 57, No. 1, 105–14, 3 figs. [25 refs.] English summary.

PESCE, H. & LUMBRERAS, H. Araneismo en el Perú, por "Latrodectus mactans". Casos observados en Lima. [**Latrodectism from** *Latrodectus mactans* **in Peru**] *An. Facul. de Med.* Lima. 1956, v. 39, No. 4, 1440–53, 1 fig. [31 refs.]

A general account and report of 3 cases.

TOXOPLASMOSIS

NUSSENZWEIG, Ruth S.; DEANE, Maria P. Estudos sôbre a transmissão do *Toxoplasma gondii*. I. Experiências com triatomíneos [**Studies on the Transmission of** *Toxoplasma gondii*. **I. Experiments with Triatomid bugs**] [NUSSENZWEIG & DEANE]. *Rev. Brasileira Malariologia*. Rio de Janeiro. 1958, Oct., v. 10, No. 4, 543–50. English summary. II. Nota sôbre a transmissão experimental pelo carrapato *Amblyomma cajennense* [**II. Experimental Transmission by Tick,** *Amblyomma cajennense*] [DEANE]. *Ibid*., 551–5. English summary.

I. The first paper describes experiments designed to ascertain whether the Triatomid bug, *Rhodnius prolixus*, was capable of transmitting *Toxoplasma*. Laboratory-bred bugs were fed on acutely infected mice, after which they were kept at room temperature. Later they were teased up in saline and inoculated intraperitoneally into mice. Examination of the intestinal contents of the bugs revealed no stages of development of the parasites, many of which appeared to be degenerating. However, inoculation of this material produced toxoplasmosis in mice, which ran an acute course if the infection in the donor-bugs was of short duration (up to 3 days), and a chronic course if the infection in them was up to 20 days old. Such chronic cases were diagnosed by the finding of pseudocysts in the brain of the mice.

Having established the fact that toxoplasms remained viable and infective after sojourn in the bugs, experiments were carried out on mechanical transmission. It was shown that when nymphs, whose feed on acutely infected mice had been interrupted, were allowed to bite clean mice, they produced in them a chronic infection. Similar infections were obtained in some mice by allowing them to ingest nymphal and adult bugs that had fed on an acutely infected mouse 3 days earlier.

II. In the second paper an account is given of experimental transmission of toxoplasmosis by *Amblyomma cajennense*. Laboratory-bred ticks were placed in a special capsule attached to the body of a mouse suffering from toxoplasmosis. In one experiment ticks removed from the mouse were teased up in saline, and the material was inoculated intraperitoneally into clean mice, producing in them acute toxoplasmosis. In another experiment a tick which had been removed from the infected mouse 17 days previously was attached in the same way to a clean mouse, where it remained for 8 days. This mouse died after 26 days, and its liver was found to be heavily parasitized with *Toxoplasma*. *C. A. Hoare*

SEEMAN, J. **Possible Role of Horses in the Epidemiology of Toxoplasmosis. (Results of Examination of Horses and other Domestic Animals by the Complement Fixation Reaction for Toxoplasmosis.)** *J. Hyg., Epidemiol., Microbiol. & Immunol.* Prague. 1959, v. 3, No. 2, 229–31. [10 refs.]

The complement-fixation reaction was observed in 389 horses brought to the Prague stock yards; 33% showed elevated titres (nearly half at over 1:32) and 67% were negative. The sera of 134 other horses were unsuitable for testing. The horses came from Czechoslovakia, Bulgaria and Rumania; when the results were analysed according to the place of origin of the animals, the Czechoslovakian were found to show a significantly higher level than the Rumanian. Other domestic animals were also examined, and their sera gave the following reactions:—17 pigs out of 44 were positive, 36 cats out of 77 were positive, and 6 dogs in 15. *P. C. C. Garnham*

FULTON, J. D. & TURK, J. L. **Direct Agglutination Test for** *Toxoplasma gondii*. *Lancet*. 1959, Dec. 12, 1068–9, 1 fig.

The authors describe a new macroscopic agglutination test for the diagnosis of toxoplasmosis. For this purpose, the peritoneal exudate of cotton-rats infected with *Toxoplasma* was centrifuged, the deposit was suspended in buffered saline, and—after standing for some minutes—the leucocytes were removed from the suspension, which was then filtered through sintered glass (pore size 15–40μ), and washed in saline. The parasites were recovered by further centrifugation and re-suspended in saline, the suspension was freed of remaining erythrocytes by agglutination or haemolysis, and—after another centrifugation—the cell-free toxoplasms were re-suspended in saline containing 1% formalin, and the suspension was stored at 2°C.

The agglutination test was performed as follows: 1 volume of parasite suspension was diluted with 3 volumes of formolized saline, and 0·4 ml. was added to an equal volume of the serum under test, which was diluted in two-fold steps covering a range from 1:10 to 1:10,240, in tubes 3 in. × 0·5 in. in diameter. These tubes (as well as controls) were shaken, placed at 37°C. for 2 hours, and left overnight at 2°C., when they were examined with the aid of a mirror. The titres were determined on the basis of the agglutination patterns formed in the bottom of the tubes, which are illustrated in the accompanying photomicrographs.

In the tests with rabbit and human sera it was shown that in normal subjects the titres were 160–320, in human cases of kala azar the distribution was comparable, whereas in the course of immunization of rabbits with toxoplasmic antigen titres of 1,600–81,920 were obtained. A comparison of human sera with high titres by the dye and agglutination tests showed close correlation between the two. The new test has a number of advantages over the dye test: it is macroscopic, easy to carry out and is done with killed parasites.

[See also this *Bulletin*, 1957, v. 54, 1463, 1464.] *C. A. Hoare*

Béquignon, R. & Vial, G. Isolement de *Toxoplasma gondii* dans le sang d'un malade atteint d'un syndrome neurologique voisin de la sclérose en plaques. **[Isolation of *Toxoplasma gondii* from the Blood of a Patient suffering from a Neurological Syndrome resembling Disseminated Sclerosis]** *Bull. Acad. Nat. Méd.* 1960, Mar., v. 144, Nos. 9/10, 180–81, 1 fig.

DERMATOLOGY AND FUNGUS DISEASES

Ziprkowski, L., Hofshi, E. & Tahori, A. S. **Caterpillar Dermatitis.** *Israel Med. J.* 1959, Jan.–Feb., v. 18, Nos. 1/2, 26–31, 8 figs. (5 on 2 pls.)

In October 1958 600 cases of caterpillar dermatitis were observed among 3,000 soldiers encamped in a pine grove. The clinical picture consisted of severe itching of the arms, thighs, abdominal region and back accompanied by a nodular urticarial and erythematous rash. In some places small vesicles appeared and there were secondary signs due to scratching. The general condition of the patients was good. There was no rise of temperature nor did conjunctivitis or changes in the respiratory tract appear.

Experimental induction of caterpillar dermatitis in volunteers is described. Dead larvae and cocoons of *Thaumatopoea wilkinsoni* as well as debris from infested pine forests could cause the dermatitis. The disease was not seasonal but might appear during all months of the year. Its appearance did not seem to be connected with hypersensitivity. The poison hairs of the insect did not act mechanically but evidence was adduced to suggest that they contain a toxin.

H. T. H. Wilson

BAYLET, J., CAMAIN, R. & SEGRETAIN, G. Identification des agents des maduromycoses du Sénégal et de la Mauritanie. Description d'une espèce nouvelle. **[Identification of the Aetiological Agents of Maduromycosis in Senegal and Mauritania. Description of a New Species]** *Bull. Soc. Path. Exot.* 1959, July–Aug., v. 52, No. 4, 448–77, 18 figs. on 4 pls. [27 refs.]

Senegal and Mauritania in French West Africa are known to have a high incidence of mycetoma pedis, and papers describing more than 100 cases have been published previously. In this paper 26 cases of maduromycosis are considered in detail and 13 cases of actinomycotic mycetoma which were studied at the same time are mentioned as forming the subject of a future publication.

After a brief clinical note on each case, the grains, the histopathology of the lesions and the appearances of the organisms in culture are described in detail. 13 cases were caused by *Madurella mycetomi*, 5 by unidentified or doubtful organisms and 8 cases are ascribed to a new pathogenic fungus which the authors have named *Leptosphaeria senegalensis* n. sp. This organism was isolated in pure culture on each occasion and a careful description accompanied by excellent photographs support the contention that it is a member of the genus *Leptosphaeria* Ces. and Not. This finding will require confirmation but it does appear to be a convincing discovery of a new causative organism.

Among those that were unidentified (2 red grained, 2 white grained and 1 black) the black-grained appeared to have been caused by the organism *Curvularia lunata*—a common saphrophyte on plants in the tropics—but the authors consider this a doubtful record.

In discussion, the interesting suggestion is made that transmission of infection in the black-grained species is in some way connected with flooded land for the incidence is high in the valley of the Senegal River where the population works in the fields inundated each year by the flood waters, whereas by contrast the red- and white-grained species (*Streptomyces pelletieri*, *S. madurae* and *S. somaliensis*) are more common in the regions which are never flooded though both have the same general climate. Can it be that the softening of the feet which results from working in water favours the entry of the black-grained organisms? [Similar conditions do occur in the endemic areas of the Sudan from temporary rain-flooding and the suggestion is worth pursuing.]

This important paper is full of mycological detail and should be read in the original by all those interested in the subject. *Peter Abbott*

TROPICAL OPHTHALMOLOGY

RODGER, F. C. **Personal Observations on some Metabolic Diseases of the Eye.** *Proc. Nutrition Soc.* 1960, v. 19, No. 1, 80–88. [38 refs.]

The author has experience of metabolic diseases of the eye with special reference to tropical countries dating back to 1945. He has travelled widely in many parts of Africa, Asia and the Middle East. He reviews and discusses metabolic diseases of the eye with reference to the literature. [This paper is very interesting but contains nothing new.] *D. P. Choyce*

McLaren, D. S. **Malnutrition and Eye Disease in Tanganyika.** *Proc. Nutrition Soc.* 1960, v. 19, No. 1, 89–91, 1 fig.

The author makes some interesting observations about vitamin A deficiency and discrete colliquative keratitis. He also has some interesting observations to make about refraction and nutrition, pointing out that in the more poorly nourished children the incidence of mixed astigmatism and anisometropia is very high indeed.

With regard to nutritional amblyopia, he has found dramatic improvement in 2 patients treated with 50 μgm. cyanocobalamin given intramuscularly daily for 4 days and thereafter twice weekly. *D. P. Choyce*

Blumenthal, C. J. **Malnutritional Keratitis.** *Proc. Nutrition Soc.* 1960, v. 19, No. 1, 92–6, 2 figs. on pl.

This is a very interesting paper concerning malnutritional keratitis in the South African Bantu [this *Bulletin*, 1950, v. 47, 1127; 1955, v. 52, 403] which apparently results directly from a diet unbalanced by excess of carbohydrate. His description is mainly clinical and contains little evidence of the nature of the nutritional deficiency which causes this condition. He makes the interesting comment that very few of these patients are to be seen in later life and he wonders why this should be. Either it could be a recent disease of the Bantu or that those afflicted with malnutritional keratitis in infancy do not survive the usual disease hazards of early and middle life. *D. P. Choyce*

Sysoyev, F. F. **Prowazek Bodies in Trachoma and their Epidemiological Significance.** *Pub. Health Rep.* Wash. 1960, Jan., v. 75, No. 1, 84–90. [Translated from Russian in *Vestnik Oftalmologii*, 1956, Mar.–Apr., 3–9.]

The author reports investigations made to discover whether or not a carrier state exists in clinically-cured trachoma or in clinically healthy persons living in trachomatous areas. For the detection of infection reliance was placed on the microscopy of conjunctival scrapings. [This paper was written in 1956 before the recent work establishing the aetiology of trachoma and it is perhaps unnecessary to mention the limitations of microscopy as a measure of minimal microbial infection.] This paper does not lend itself to abstraction and should be consulted in the long version. However, the following figures give some conception of the general trend of the findings. Scrapings from 2,933 persons were examined. This group comprised 1,297 clinically healthy, 53 suspected trachoma and 265 cases of conjunctivitis (151 catarrhal and 114 follicular). The remaining 1,318 were trachomatous in one or other of the 4 stages of the disease: acute, sub-acute, chronic and clinically recovered. Virus was demonstrated in 23·0, 10·5, 9·49 and 4·0% respectively at these four stages of the disease. It was found in a very small number of cases of non-trachomatous conjunctivitis and the scrapings from a somewhat similar percentage—1·0—of clinically healthy patients were positive. *S. P. Bedson*

BERNKOPF, H., NISHMI, M., MAYTHAR, B. & FEITELBERG, I. **Darkfield Agglutination of Fluorocarbon-Treated Trachoma Virus by Serums of Trachoma Patients and Immunized Rabbits.** *J. Infect. Dis.* 1960, Jan.–Feb., v. 106, No. 1, 83–6. [15 refs.]

Suspensions of trachoma virus were grown in the yolk sac of chick embryos and purified and concentrated by treatment with Freon-heptane and fractional centrifugation. The tests were made in small sterile cork-stoppered tubes of 10 mm. internal diameter, readings being taken after incubation overnight at 37°C. by the examination of a loopful between slide and coverslip with dark-ground microscopy. Good agglutination was obtained with sera prepared in rabbits; that observed with human trachoma sera was less massive and complete, but still quite easy to read.

Comparison of the agglutination and complement-fixation tests was made with 48 sera from patients with active trachoma, 40 from patients with inactive trachoma and 45 from clinically normal persons. The agglutination test proved the more sensitive: 88% and 60% positive in the two trachoma groups by agglutination, as against 54% and 40% respectively by complement fixation. Further work to evaluate these reactions is required, however, since both gave some positive results with "normal" sera. *S. P. Bedson*

TROPICAL ENVIRONMENTAL CONDITIONS

KUTZ, H. E. Hitzeschäden. Ein Überblick über Pathogenese, Klinik und Therapie. **[Heat Disorders; a Survey of Pathogenesis, Clinical Features and Treatment]** *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1959, Aug., v. 10, No. 2, 178–231. [400 refs.]

This is a painstaking and unbiased review of the illnesses due to environmental heat. The author discusses the disordered physiology, predisposing factors, clinical and pathological features, and treatment and prevention of the following effects of heat: heat hyperpyrexia, heat cramps, the eccrine miliarias [*e.g.* prickly heat], and heat exhaustion due to circulatory insufficiency, salt deficiency, water deficiency, and anhidrosis. Commendably, he has not further confused the nomenclature of all these disorders but has followed a classification recently suggested by the Medical Research Council of Britain [see this *Bulletin*, 1959, v. 56, 96].

[English-speaking readers who turn to this review expecting to find a pool of information with which they are unfamiliar may be disappointed, for most of the 400 references are to papers and books published originally in English and already often reviewed in this language. The article is none the less well worth reading.] *C. S. Leithead*

MISCELLANEOUS DISEASES

ARNOTT, W. M. **A Problem in Tropical Cardiology.** *Brit. Med. J.* 1959, Dec. 12, 1273–7. [18 refs.]

In a paper, based on one presented in a discussion on the epidemiology of heart disease organized by the International Epidemiological Club and held at Cali, Colombia, in 1959, Professor Merville Arnott first refers to the lack of studies on the environmental aspects of heart disease. This he suggests may be a result of cardiologists being more concerned with the end results of heart disease than with its evolution in its natural background, while family practitioners who have had the necessary opportunity to observe the evolution of such diseases in relation to environment, have in general not possessed the necessary detailed knowledge. Cardiologists have also, he states, been slow to realize the importance of close association with epidemiologists, biochemists and immunologists. The features of endomyocardial fibrosis as reported by BEDFORD and KONSTAM (*Brit. Heart J.*, 1946, v. 8, 236), by WILLIAMS *et al.* [this *Bulletin*, 1955, v. 52, 203] and others are then referred to, and with these, readers of this *Bulletin* will be familiar. The author also gives it as his opinion that there is no evidence of endomyocardial fibrosis having occurred in an inhabitant of Great Britain who has not been abroad.

In referring to aetiology, particular attention is drawn to the work of GILLANDERS (*Brit. Heart J.*, 1951, v. 13, 177) in Johannesburg who found evidence of liver disease of the type commonly regarded as due to malnutrition, in a group of patients with cardiac failure who also had interfibrillary oedema, hypertrophy of the muscle fibres, no hydropic degeneration, and minimal interstitial fibrosis in the heart. Aetiological suggestions put forward by a number of workers are reviewed; the suggestion that a virus infection may produce the initial lesion is considered, an allergic aetiology is thought to have little to support it for the eosinophilia which has commonly been noted in patients with endomyocardial fibrosis is often due to coincident parasitism. Rheumatism is regarded as an unlikely cause for though in endomyocardial fibrosis valvular distortion occurs the resemblance to rheumatism is not close. Stenosis akin to that seen in rheumatism is uncommon in endomyocardial fibrosis. The geographical distribution of the disease is not restricted to that of any known parasite and it seems to be too widespread throughout Africa to make an inborn metabolic error or sicklaemia a likely cause. Chemical factors of the kind considered responsible for veno-occlusive disease in the West Indies are considered and it is thought possible that among the innumerable vegetable products eaten in Africa, there are substances present which could cause specific myocardial damage. Reference is made to thickening of the cusps of the pulmonary valves and narrowing of the right ventricular outflow tract, sometimes seen in patients with massive hepatic metastases from a carcinoid tumour. These changes are thought to be due to the large amount of 5-hydroxytryptamine (serotonin) which the tumour produces. Bananas contain considerable amounts of serotonin and are widely eaten in Africa. The quantities of serotonin in the blood-stream resulting from eating bananas could, however, hardly be compared with those found in patients with carcinoid tumours and furthermore as serotonin is destroyed in the lungs the heart changes in carcinoid are limited to the right ventricle whereas those in endomyocardial fibrosis are present in both the right and left heart.

Concerning future investigations, it is urged that in addition to clinical and haemodynamic studies, the general physical state with particular reference to blood proteins and immunological responses should receive further attention as also should the nature of the patient's environment, particularly regarding his diet, medicine and parasites. Further studies of the incidence of the syndrome in relation to location in time and space are required. Seasonal changes in foodstuffs, particularly those of vegetable origin, might reveal the presence at times of some vegetable toxins. It is also important for groups of observers to study the disease in widely scattered areas.

[See also WOODRUFF, *E. African Med. J.*, 1959, v. 36, 527 ; this *Bulletin*, 1960, v. 57, 529.] *A. W. Woodruff*

GOWER, N. D. & FROMMER, Eva. **Favism in a Cypriot Child.** *Lancet*. 1960, Mar. 19, 628–9. [11 refs.]

DANNENBERG, A. M., Jr. & SCOTT, Eva M. **Melioidosis: Pathogenesis and Immunity in Mice and Hamsters. III. Effect of Vaccination with Avirulent Strains of *Pseudomonas pseudomallei* on the Resistance to the Establishment and the Resistance to the Progress of Respiratory Melioidosis caused by Virulent Strains; all-or-none Aspects of this Disease.** *J. Immunology*. 1960, Mar., v. 84, No. 3, 233–46, 5 figs. [25 refs.]

See this *Bulletin*, 1958, v. 55, 453 ; 1959, v. 56, (365).

MURNAGHAN, M. F. **Conduction Block of Terminal Somatic Motor Fibers in Tick Paralysis.** *Canadian J. Biochem. & Physiol.* 1960, Mar., v. 38, No. 3, 287–95, 1 fig. [18 refs.]

PARASITOLOGY: GENERAL

BALL, G. H. **Some Considerations regarding the Sporozoa.** *J. Protozoology*. Utica. 1960, Feb., v. 7, No. 1, 1–6. [58 refs.]

In his presidential address to the Society of Protozoologists last year, the author puts forward some interesting ideas about the Sporozoa, the one ill-defined class of the Protozoa, into which it is customary to place any organism of uncertain affinity. The only character which is entirely constant about them is that they are all parasitic in their mode of life.

He takes as an example *Toxoplasma* which has almost capriciously been removed from class to class, and now placed by him in the Sporozoa. Inside the class also, rapid changes are taking place in the classification of the coccidial and haemosporidian parasites, while the taxonomy of the haemogregarines badly needs revision. The finer details of the structure of Sporozoa are only now being determined by electron microscopy, and their cultivation

in vitro has hitherto been too unsuccessful to allow genetic studies to advance as they have in other classes. The author is sceptical about the idea that absence of pathogenicity in a host is evidence of a long phylogenetic association, and he thinks it is better to base evolutionary arguments on other types of evidence. The biochemistry of the Sporozoa provides a useful way of observing host parasite relationships, and even of distinguishing between strains and species. *P. C. C. Garnham*

CHANG, Yuan-Ch'ang. **Parasitic Infestations of the Brain.** *Chinese Med. J.* Peking. 1960, Feb., v. 80, No. 2, 121–6. [38 refs.]

A review of Chinese literature in the last 10 years.

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abtracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

SOLLERS, Helen. **1958 World Resumé of Mosquito Activities.** *Proc. 46th Ann. Meeting New Jersey Mosquito Extermination Ass.* 1959, Mar. 18, 19 & 20, 16–43.

This presentation gives a very informative review on work concerning mosquitoes relating to the year 1958. After a general introduction which includes current information on resistance to insecticides, malaria eradication, entomological matters, congresses and other subjects of general interest, the author discusses the subject of mosquito activities in 1958 under the headings taxonomy, distribution, technique, behaviour, biology and ecology, morphology and physiology, encephalitis, filariasis, malaria, yellow fever, adulticides, larvicides, resistance, equipment, attractants and repellents. Full references are given to published literature. A useful addition is an alphabetical author index at the end of the paper.

This compilation, which is prepared annually by Miss Sollers of the U.S. Department of Agriculture, is an admirable and readable review which will be of great practical value to those who require a ready summary of current activities in the field of mosquitoes and their control.

H. J. O'D. Burke-Gaffney

VINCKE, I. H. Note sur les culicidés dans la vallée de la Lufira (1941–1942). [**Note on the Culicidae of the Lufira Valley (1941–1942)**] *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 423–34. [13 refs.]

The Lufira Valley is in the Upper Katanga district of the Belgian Congo. *Mansonioides* mosquitoes are particularly abundant and composed over 95% of the total catch of adult mosquitoes. Most of the larvae (96%) and adults

(90%) of *Mansonioides* collected were *M. uniformis*. Less than 2% of the total adult catch were anophelines, although 20 species and varieties of *Anopheles* were recorded. The commonest adult *Anopheles* captured was *A. funestus*.

Observations on the biology of *Mansonioides* in this part of Africa occupy most of this paper. The larvae have been found attached to 20 species of aquatic plant, especially the grasses *Leersia* and *Oryza* (rice). Detailed observations are recorded of the larval breeding places.

Very few adults were found resting in huts during the day, although the females bite during the day in humid places, not necessarily near the breeding places. Numbers of females fed on man at night out-of-doors and entered Magoon traps baited with sheep. Catches at night were reduced when the wind speed exceeded 2 (Beaufort Scale).

Females captured in 4 Magoon traps were dusted with coloured powders from a "fly-tox" and released. About half a million females were treated in this way. In the same number of females captured in 50 places after the release, 704 were marked by colour. Of these, 235 were captured from 0–5 km., 430 from 5–10 km., 39 from 10–15 km. and none was captured more than 15 km. from the release point. *B. R. Laurence*

SURTEES, G. **The Genus *Mansonia* Blanchard 1901 (Diptera: Culicidae) in West Africa.** *West African Med. J.* 1960, Feb., v. 9 (n.s.), No. 1, 7–11. [25 refs.]

This is a review of the recorded distribution in West Africa of 7 species of the subgenus *Coquillettidia* and the 2 African species of the subgenus *Mansonioides*, with some account of the habits of each species.

In Southern Nigeria *M. metallicus*, *M. africanus* and *M. uniformis* have been found by the author, in the larval stage, attached to *Pistia* and associated with *Ficalbia pallida*. *B. R. Laurence*

MOUCHET, J., GARIOU, J. & HAMON, J. Note faunistique sur les moustiques des montagnes de l'Ouest-Cameroun. Présence de neuf formes de Culicidae nouvelles pour le Cameroun. [**Note on Mountain Mosquitoes in the West Cameroons Region. Presence of Nine Forms New to the Cameroons**] *Bull. Inst. Français d'Afrique Noire*. Sér. A. 1960, Jan., v. 22, No. 1, 207–16.

[See this *Bulletin*, 1959, v. 56, 510.]

KELLEN, W. R. & LIPA, J. J. *Thelohania californica* **n. sp., a Microsporidian Parasite of** *Culex tarsalis* **Coquillett.** *J. Insect. Pathol.* New York. 1960, Mar., v. 2, No. 1, 1–12, 32 figs.

LAMBREMONT, E. N. **Postemergence Changes of Enzyme Activity in the Mosquito,** *Aëdes aegypti* **(L.).** *Ann. Entom. Soc. of America*. 1960, Jan., v. 53, No. 1, 86–91, 1 fig. [31 refs.]

BURGESS, L. **Probing Behaviour of *Aedes aegypti* (L.) in Response to Heat and Moisture.** [Correspondence.] *Nature*. 1959, Dec. 19, v. 184, Suppl. No. 25, 1968–9, 1 fig.

The number of female *Aëdes ægypti* probing near a human arm has been counted during 16-minute observation periods each day for over 20 days after emergence. The mosquitoes were maintained from day to day during this period on 10% sucrose solution and were kept under constant conditions (76–78°C., 56–58% RH) in a 9 ft. cubic cage over a convection current of warm moist air rising through the screen floor of the cage.

The number of females probing daily followed a rhythmic pattern, with peaks of activity every 3–4 days. Mated and unmated females showed this rhythm of activity.

Females also probed, in the absence of the host arm, if 15–20 cc. of carbon dioxide were introduced into the cage and, under these conditions, probing activity also became rhythmical. In the absence of the host, or carbon dioxide, no probing activity was observed.

[See also this *Bulletin*, 1958, v. 55, 1284; 1959, v. 56, 573.]

B. R. Laurence

DOBY, J. M., DAVID, F. & RAULT, B. L'élevage, en laboratoire, de l'oeuf à l'adulte, de *Simulium ornatum* Meigen, 1818, *S. aureum* Fries, 1824, *S. erythrocephalum* de Geer, 1776, *S. decorum* Walker, 1848 (Diptères, Nématocères, Simuliidés). Observations biologiques concernant ces espèces. **[Rearing in the Laboratory, from Egg to Adult, of *Simulium ornatum, S. aureum, S. erythrocephalum* and *S. decorum*, with Biological Observations on these Species]** *Ann. Parasit. Humaine et Comparée*. 1959, v. 34, Nos. 5/6, 676–93, 2 figs. [25 refs.]

In the parasitological department of the Faculty of Medicine in Rennes, France, *Simulium ornatum*, *S. aureum*, *S. erythrocephalum* and *S. decorum* have been reared, in the laboratory, from egg masses collected in the field. The larvae have been reared in glass cylinders, divided by a vertical partition of glass, from the base of which air was bubbled up through the water. Food was provided by the addition daily of a number of drops of a suspension obtained from an infusion of beer yeast, potato starch and grass leaves. The quantity of infusion added depended upon the number and size of the larvae present in the rearing cylinder. Certain species, such as *S. ornatum* and *S. aureum*, are said to tolerate excess pollution by the infusion but others, such as *S. hirtipes* and *S. tredecimatum*, did not tolerate excess infusion in the water. Laboratory temperatures were maintained between 17° and 23°C. but in the event of heavy mortality in the cultures lower temperatures were used. *S. hirtipes*, for instance, did not survive well at temperatures above 15°C.

Notes are also given on the oviposition habits, including mixed species ovipositions, duration of the life cycle, and the probable number of generations per year, in the 4 species reared.

There is also a useful review of previous methods used to rear the early stages of *Simulium* to the adult state. *B. R. Laurence*

OPPENOORTH, F. J. **Genetics of Resistance to Organophosphorus Compounds and Low Ali-Esterase Activity in the Housefly.** *Entomologia Exper. et Applicata.* Amsterdam. 1959, Dec., v. 2, No. 4, 304–19, 6 figs.

In a previous paper [VAN ASPEREN and OPPENOORTH, this *Bulletin*, 1959, v. 56, 778] it was shown that 5 strains of house-flies resistant to organophosphorus insecticides had only about one-fifth of the ali-esterase activity found in 6 susceptible strains. It would confirm the causal relationship between resistance and low ali-esterase activity if they could be shown to be inherited together.

At least two distinct kinds of organophosphorus resistance have been demonstrated, involving respectively malathion and parathion-plus-diazinon [BUSVINE, *ibid.*, 1959, v. 56, 894; OPPENOORTH, *Entomologia Exper. et Applicata*, 1959, v. 2, 216]. Recent work by NGUY and BUSVINE (in press) has shown that both types are inherited on the basis of single genes, probably alleles. In the present paper, the inheritance of low ali-esterase activity has been studied (as well as that of resistance) by measurements of esterase in individual flies. These were made after the flies had reproduced; or else the esterase levels of flies were judged from their progeny.

The results with a malathion-resistant strain (crossed with a susceptible one) were consistent with single gene inheritance, which adequately explained the resistance. On the other hand, a diazinon-resistant strain appeared to involve two factors: a single gene inheritance of low ali-esterase activity, which was associated with part of the resistance, and another factor responsible for the remainder. By suitable selective breeding, strains dependent on each factor were isolated.

The general explanation of this type of resistance seems to be that the ali-esterase is modified by a series of alleles to produce a number of closely related defence mechanisms. But these various defence mechanisms tend to have somewhat different specificity in coping with diazinon, malathion, etc. The significance of the additional factor in the diazinon-resistant strain is not yet clear. *J. R. Busvine*

FURMAN, D. P., YOUNG, R. D. & CATTS, E. P. *Hermetia illucens* **(Linnaeus) as a Factor in the Natural Control of** *Musca domestica* **Linnaeus.** *J. Econom. Entom.* 1959, Oct., v. 52, No. 5, 917–21.

Laboratory and field investigations were initiated after lay reports that, under certain conditions, the larvae of the soldier fly, *Hermetia illucens*, exercised some degree of natural control over the house-fly, *Musca domestica*.

Hermetia larvae were reared in the laboratory on the CSMA (Chemical Specialties Manufacturers' Association) standard medium. The length of larval life was over 2 weeks and the pupal stage was about 2 weeks although some flies only emerged 4–5 months after pupation. Adults lived for approximately 2 weeks, being fed on sugar-water and honey-water. Mating did not take place under laboratory conditions but females laid sterile eggs in the larval medium.

A number of laboratory experiments with combined cultures of the larvae of the two species were carried out. The results are tabulated and indicate that the presence of soldier fly larvae strongly inhibits the successful development

of house-fly larvae. Results from field experiments on a poultry farm in the San Joaquin Valley, California, tended to confirm the laboratory findings.

Hermetia larvae did not exhibit any predacious behaviour and experimental evidence shows that they do not give out substances in the medium which inhibit the normal development of house-fly larvae. The authors believe that house-fly larvae are unable to compete with soldier fly larvae for food.

Field observations in the San Joaquin Valley, California (winter rainfall and high summer temperatures), are briefly recorded and it was found, *inter alia*, that poultry manure carrying heavy infestations of *Hermetia* larvae was rarely associated with house-fly breeding.

The deliberate control of house-flies by soldier flies would not be " trading one pest for another " since *Hermetia* seldom enters houses.

[See also this *Bulletin*, 1960, v. 57, 305.] *B. C. Fine*

MENGLE, D. C. & O'BRIEN, R. D. **The Spontaneous and Induced Recovery of Fly-Brain Cholinesterase after Inhibition by Organophosphates.** *Biochem. J.* 1960, Apr., v. 75, No. 1, 201–7, 3 figs. [24 refs.]

LE CORROLLER, Y. & PIERRE, J. L. Sur un cas de linguatulose humaine au Maroc. [**A Case of *Linguatula* Infection in Man in Morocco**] *Bull. Soc. Path. Exot.* 1959, Nov.–Dec., v. 52, No. 6, 730–33, 3 figs. on pl.

See also p. 695, STEYN *et al.*, **Resistance of the Body Louse (*Pediculus humanus corporis* de G.) to DDT Powders.**

BRADY, U. E., Jr., DOROUGH, H. W. & ARTHUR, B. W. **Selective Toxicity and Animal Systemic Effectiveness of Several Organophosphates.** *J. Econom. Entom.* 1960, Feb., v. 53, No. 1, 6–8, 1 fig. [11 refs.]

KRUEGER, H. R., O'BRIEN, R. D. & DAUTERMAN, W. C. **Relationship between Metabolism and Differential Toxicity in Insects and Mice of Diazinon, Dimethoate, Parathion, and Acethion.** *J. Econom. Entom.* 1960, Feb., v. 53, No. 1, 25–31, 4 figs. [12 refs.]

REPORTS AND SURVEYS

MORVAN, R. & CAMPANA, J. Les Touaregs Ajjer et Fort-Polignac. Étude géographique, historique et médicale. [**Geographical, Historical and Medical Study of the Touaregs of Ajjer and Fort-Polignac**] *Arch. Inst. Pasteur d'Algérie.* 1959, Sept., v. 37, No. 3, 474–549, 9 figs. & 18 pls. [31 refs.]

Ajjer is a Commune about half the size of France, deep in the Algerian Sahara in the south-east of the territory, and Fort-Polignac is a small centre

scarcely deserving the name of oasis, 27°N., 8°E. To the south is the Tassili, a barren plateau ribbed by innumerable straight ravines and presenting a chaotic appearance of tumbled rocks in the mountainous desert. The climate is extreme, winter minimum temperature being below freezing and the summer maximum being over 47°C. (116°F.), while the rainfall varies from one-fifth to three-fifths of an inch. The population is very sparse and now, robbed of its previous mainstays of slave trading and marauding, is largely nomadic, depending on a little minor cultivation and the camel.

The account gives a long and interesting description of the people, their clothing, history, habits, nomadism, nourishment and general way of life, and is well illustrated with drawings and photographs. There is virtually no deliberate measure of hygiene though dispensaries and hospital mechanisms have been established. As far as the nature of sickness is concerned, the nomad has cause to fear the rigours of the climate more than all other things and it can be said that climatic extremes, dryness and cold, together with hunger and thirst, are vastly more important than malaria or syphilis. Malaria is absent in Fort-Polignac but epidemics have been known in the Tassili; *Plasmodium vivax*, *P. falciparum* and *P. malariae* are all known and the following anopheline species are reported: *Anopheles broussesi*, *A. multicolor*, *A. hispaniola*, *A. sergenti*, *A. dthali*. The most important infectious diseases are measles, chickenpox, German measles, whooping cough, gastro-enteritis and dysentery. Tuberculosis is common and as in other parts of this area, eye conditions, trachoma and bacterial conjunctivitis are common to the extent of being almost universal. It is interesting to note that amoebiasis has never been encountered and that epidemic typhus, well known elsewhere in Algeria, does not occur. Among helminth infections, it is notable that schistosomiasis is well known in part of the area, the limit of the extension of the disease occurring in this district. The account closes with further notes on the known infectious diseases. Cancer is said to be rare but appears notably more prevalent than is indicated in any other comparable descriptions of oases which have appeared in this series. [See this *Bulletin*, 1957, v. 54, 896; 1958, v. 55, 1182; 1959, v. 56, 495, (1276); 1960, v. 57, 90.] *G. Macdonald*

BOOK REVIEWS

GOARNISSON, J. **Guide médical africain. Médecine tropicale.** [African Medical Handbook] Preface by L. AUJOULAT. 4th edition. pp. xiii + 719, 220 figs. 1959. Issy-Les-Moulineaux: Les Presses Missionnaires. Imprimerie Saint-Paul, 184, Avenue de Verdun, Seine, France.

This book is perhaps the most ambitious and complete guide which exists for the use of laymen, nurses and auxiliary medical personnel responsible for treating the sick in Africa. The matter is arranged in a clear and classified manner and the style is confident and didactic, tending to suggest that diagnosis and treatment are easy and inevitable if only one follows the rules.

This fourth edition has been enlarged and brought up to date, though a little more elimination of outdated knowledge, methods and drugs might have been

done with advantage. For instance the erroneous theory that the malarial sporozoite enters first the red cell still figures in the text and in a diagram, though a note in small print hints that recent research suggests that it first enters " elements " of the reticulo-endothelial system, also a theory outdated by a dozen years. Phenothiazine and carbon tetrachloride still retain a place which their toxicity does not warrant. Strangely enough, no adequate mention is made of pentamidine prophylaxis of trypanosomiasis, a disease on which the author is an authority. Some rather irrelevant additions seem to have been made such as the long account of adrenocortical function in the pathology of malaria.

But these are minor criticisms in a book of which the author and his fellow White Fathers can be proud, and which will remain an indispensable help to them in their beneficent work in Africa, as also for many others, especially those engaged in the teaching of subordinate medical personnel.

[For review of first edition, see this *Bulletin*, 1949, v. 46, 990.]

Clement C. Chesterman

DALAND, Geneva A. [B.S.] Edited by Thomas Hale HAM, M.D. Illustrations by Etta PIOTTI. **A Color Atlas of Morphologic Hematology with a Guide to Clinical Interpretation.** Revised Edition. 72 pp., 9 figs. & 16 coloured pls. 1959. Cambridge: Harvard University Press, Mass., U.S.A. [55s.]

Colour atlases of haematology have an irresistible attraction ; and yet at the same time they invite criticism, whether they consist of colour photographs or (as in this case) of beautifully executed diagrams in colour. This is because the cells or conditions they display appear, in actual practice, in far more numerous guises than any atlas can encompass, and because microscopic diagnosis in haematology, though it begins with morphological recognition, is in fact a distillate from the experience of reviewing many microscopic fields, an experience that an atlas cannot supply. In the present case, much of this criticism is disarmed in the author's preface, where he states that the purpose of the atlas is to " furnish a guide for reference in the study of films of peripheral blood . . . " and that the diagrams " are oversimplified for use as working hypotheses by those who are concerned with diagnosis and treatment ".

If these provisos are borne in mind, and particularly that the plates are composite illustrations, crowding into one glance all the abnormal features that are relevant, this is one of the best of atlases. There are 16 plates, containing in fact 29 separate illustrations, though only dealing with some 15 diagnostic entities. The text (67 pages) is built around the illustrations, and amply repays careful reading, for it supplies just that discussion of variations, difficulties, and interpretations, which is needed to round out the conciseness of the diagrams. It is not a textbook of haematology, but with its 316 references, nearly all of which are of direct clinical relevance, it supplies more than a foundation for the interpretation of peripheral blood films. *Alan B. Raper*

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